FLORA CAPENSIS.

VOL. V. SECT. 2.

(SUPPLEMENT.)

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FLORA CAPENSIS:

BEING A

SYSTEMATIC DESCRIPTION OF THE PLANTS

OF THE

CAPE COLONY, CAFFRARIA, AND PORT NATAL

(AND NEIGHBOURING TERRITORIES)

BY

VARIOUS BOTANISTS.

EDITED BY

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VOLUME V. SECTION 2 (SUPPLEMENT).

GYMNOSPERMÆ.

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PREFACE.

When the *Flora Capensis* was originally planned, it was intended to include the *Gnetaceæ*, *Coniferæ*, and the *Cycadaceæ*. The description of *Welwitschia* was prepared for the purpose several years ago by the late Professor H. H. W. Pearson, and the Conifers were described by Dr. O. Stapf, F.R.S., late Keeper of the Herbarium and Library. Sir William Thiselton-Dyer, the Editor of the later volumes of the *Flora Capensis*, had always intended to write the account of the South African *Cycadaceæ* after his retirement, but failing health prevented him from carrying out the project, to which he had for many years devoted considerable study. Shortly before his death he handed over to me the material he had collected together and his notes, expressing the wish that I should undertake the work. While in South Africa in 1930, I was able to discuss the matter with Dr. Rattray, who has made careful studies of the South African Cycads in the field, and has grown most of them in his garden. He very kindly agreed to collaborate with Mr. J. Hutchinson, F.L.S., in the preparation of the descriptions of the Cycads for this supplemental volume. While Mr. Hutchinson is mainly responsible for the technical descriptions, Dr. Rattray's intimate knowledge of the plants, as they grow in South Africa, has added very greatly to the value of the undertaking.

The account of *Welwitschia* has been supplemented by Mr. Hutchinson to bring it up to date in the light of recent knowledge. It has been raised to family rank as distinct from *Gnetaceæ* (*Gnetum* and *Ephedra*), with which it has probably little in common apart from the Gymnospermous character. Dr. Stapf has largely re-written his descriptions of the South African *Podocarpaceæ* and *Cupressaceæ*.

The publication of this supplemental part of the *Flora Capensis* has been made possible by the generosity of the Government of the Union of South Africa, who on learning, through Kew, of the desire expressed by Botanists in South Africa for an account of the Gymnosperms, made a grant of £40 towards its publication.

The history of the inception and completion of the *Flora Capensis*, which deals with the flowering plants proper—*Angiospermæ*—was published by Sir William Thiselton-Dyer in the *Kew Bulletin*, 1925, pp. 289–293, and his valedictory preface will be found in Vol. V, Sect. 2, Part IV, of the *Flora Capensis*, written on 23rd September, 1924.

For the loan of herbarium material from South Africa we are much indebted to Dr. I. B. Pole Evans, C.M.G., Director of the Botanical Survey, to the Forestry Department in South Africa, and to the Directors of the Cape Town and Albany Museums.

ARTHUR W. HILL.

Royal Botanic Gardens,

Kew, March 25, 1933.

Addenda.

E. kosiensis.

p. 28, 5 lines from below, *after* unbranched, *insert* :—

(see also (4) *kosiensis*).

p. 34, after notes to no. 4, *E. kosiensis* (Hutch.), *add* :—

A letter from Col. Molyneux, received after going to press, states that he has growing at the Old Fort Garden, Durban, specimens of this species 4 ft. in height, which have produced cones of a bright red colour. Probably in the wild state the stem never rises more than a few inches above the sandy soil in which it grows near the coast, but in cultivation produces a short aerial stem, as in some other species.

Order CXXVI. **WELWITSCHIACEÆ.**

(By H. H. W. Pearson.)

Flowers unisexual or pseudobisexual. *Male* (pseudobisexual) *flower* : *Envelope* of 2 imbricating whorls ; outer whorl of 2 laterally placed, free, boat-shaped, keeled scales ; inner of 2 median broadly obovate or subrotund keel-less scales, connate at the base. Stamens 6, exserted ; filaments connate into a short tube at the base ; anthers somewhat 3-lobed when mature, 3-celled, dehiscing by 3 slits from the summit ; pollen ellipsoid, slightly coherent in irregular masses. Ovule solitary, terminal, erect, orthotropous, imperfect, with the single integument produced into a tubular micropyle, sharply bent near the middle, expanding at the tip into an exserted glandular-papillose stigmatiform disc. *Female flower* : *Envelope* bottle-shaped, contracted at the throat, of 2 laterally placed, connate leaves, compressed from back to front, with 2 lateral membranous wing-like expansions from the midribs. *Ovule* solitary, terminal, erect, orthotropous, perfect, with its single integument produced into a straight micropylar tube through the mouth of the envelope ; micropylar tube irregularly labiate or fimbriate, but not expanded at the apex. *Seed* flattened, closely invested by the winged envelope ; endosperm starchy, wedge-shaped below, retuse above, supporting the withered nucellar cap (*perisperm*) ; radicle erect ; cotyledons 2, rarely 3, narrow-linear ; suspensor long, coiled, persistent.

Distrib. Genus 1, species 1, confined to the coast region of South West Africa, from about 15½° S. in Angola (south of Mossamedes) to the tropic of Capricorn, in Great Namaqualand.

WELWITSCHIA,* Hook. f. (*Tumboa* Welw.).

Characters as for the family.

1. **W. Bainesii** (Carr. Conif. ed. ii. 783 (1867)) ; plant body (*hypocotyl*) woody, covered by thick corrugated cork, sometimes fused with other individuals, when injured exuding a copious gummy secretion congealing in alcohol, broadly obconic or turbinate, con-

* Name conserved according to International Rules.

cave on the top, more or less circular or elliptic in horizontal section, rising ¼–1 ft. above the ground, 1–3 ft. in diam. at the top ; epicotyl reduced to 2 leaf-bearing grooves and floriferous cushions forming a raised rim around the top of the hypocotyl interrupted at the longer diameter, and a depressed and early arrested stem apex, at length buried beneath two coalescent corky expansions overlying the concave summit of the hypocotyl and developed from the buds in the axils of the cotyledons ; taproot greatly elongated, unbranched in the upper part, at length very slender, branched and brittle ; leaves 2, rarely 3, each inserted in an epicotylar leaf-groove extending round half the raised rim of the hypocotyl, oblong, entire, usually in old plants torn into few or many strap-like segments from apex to base, thick, leathery, with the main nerves parallel and distinct, growing at the base as long as the plant lives, dying at the apex, up to 4 yards long ; spikes arranged in compound dichasial cymes (rarely solitary) arising annually from pits in the floriferous cushions situated immediately above, not seldom immediately beneath, each leaf ; male spike bearing 40-70 axillary flowers in 4 rows ; bracts connate, lowest pair or 2 pairs barren ; flowers concealed by the bracts until the exsertion of the anthers ; female spike bearing 40–60 flowers in 4 rows ; lowest 6–10 pairs of bracts increasing in size from below upwards, barren, the lowest 2 or 3 pairs connate. Except the micropylar tube, the naked seed completely concealed by the bract at maturity. Marloth, Fl. S. Afr. i. 107, fig. 68 a and b. *Tumboa Bainesii*, Hook. f. in Gard. Chron. 1861, 1008 ; Naudin Rev. Hort. 1862, 186 ; Rendle in Cat. Afr. Pl. Welw. ii. 257 (1899) ; Engl. Pflanzenw. Afr. ii. 90–93, fig. 85 (1908). *Tumboa strobilifera*, Welw. in Gard. Chron. 1862, 71. *Welwitschia mirabilis*, Hook. f. in Gard. Chron. 1862, 71, in Trans. Linn. Soc. xxiv. 1. tt. 1–14 (1863), and in Bot. Mag. tt. 5368, 5369 (1863) ; McNab in Trans. Linn. Soc. xxviii. t. 40 (1873) ; Monteiro, Angola and River Congo, ii. t. 15 (1875) ; Schimper, Pflanzen-Geogr. 662, 664 (1898) ; Warburg, Kimena-Sambesi Exped. frontisp., p. 6 (1903) ; Karsten & Schenck, Veg.-Bild. i. t. 25 (1903) ; Pearson in Kew Bull. 1907, 347, pl. 2, figs. 3–5 ; L. Schultze, Namaland & Kalahari, t. 3 (1907) ; M. G. Sykes in Trans. Linn. Soc. Bot. ser. ii. vii. 327, t. 34–5 (anat.) ; Velenovsky, Vergl. Morphol. Pfl. iii. 775 (1910) ; iv. Suppl. t. 1 (1913) ; Coulter & Chamberlain Morph. Gymnosp. 365, 366, 374, 399 (1910) ; Church in Phil. Trans. (B) ccv. (1914), 115, with figs. ; Pearson in Prain Fl. Trop. Afr. vi. ii. 333 (1917).

South-West Africa : Namib region from north of Sandfisch Bay (23½° S.) to the northern boundary, and continued along the low coastal belt of Angola to south of Mossamedes (15½° S.).

This weird type of plant may not be so rare as has generally been supposed. According to an account in the *Diamond Fields Advertiser*, Kimberley, for April 28th, 1932, *Welwitschia* occurs in great quantity in the Kakoa-veld in North-West Damaraland ; the writer there states that he observed " an area

of not less than 2,500 square miles where the gravelly surface of the ground, up hill and down dale, is covered with the plant, in some places in such profusion that it was impossible to find an opening through which to pilot the car, and we were forced to back out and make wide detours; some plants stretched to a diameter of 16 ft." (*See also* Journ. Bot. Soc. S. Afr., pt. xviii, 4, 1932.)

Mr. Worsdell informs us that the plant is fairly common (" many hundreds ") in the dried-up bed of a stream and on small granite hillocks about a mile to the south of Old Welwitsch Railway Station; the crown of the stem of the largest specimen was nearly 6 ft. in diameter.

Order CXXVII. A. **PODOCARPACEÆ.**

(By O. Stapf.)

Dicœcious, very rarely monœcious. *Male strobiles* mostly catkin-like, sometimes externally only slightly differentiated from the vegetative branches, simple or compound, terminal or axillary, solitary or fascicled, bracteate or ebracteate at the base; fertile scales bearing basi-dorsally 2 pollen-sacs, squamiform or more or less differentiated into a claw or stalk and blade, the latter large and projecting beyond the pollen-sacs, or very much reduced, when the scales with their pollen-sacs assume the appearance of typical angiospermous stamens; pollen grains mostly winged. *Female strobiles* usually much reduced, terminal or axillary; lower scales barren, the upper or only the uppermost fertile, always simple, each bearing 1 (very rarely 2) ovule; ovule usually more or less exceeding its scale, sometimes long-exserted, rarely quite enclosed. *Mature strobiles* usually little altered or the axis or also the scales becoming more or less fleshy. *Seeds* usually exserted; seed-shell (testa) coriaceous to woody, with or without an outer covering (*epimatium*), which is either free or more or less fused with the testa, and varies from membranous to leathery or fleshy.

Shrubs or trees; leaves usually spirally arranged, quaquaversal or dorsiventrally disposed in one plane, scale-like or linear to lanceolate, rarely ovate, always evergreen.

Distrib. Genera 7, with about 100 species, mostly in the tropics and the southern temperate zone.

I. **PODOCARPUS**, L'Hérit.; Benth. et Hook. f. Gen. Pl. iii. 434.

Dicœcious, very rarely monœcious. *Male strobiles* usually axillary, variously arranged, bracteate at the base, sessile or peduncled; scales numerous, spirally arranged, imbricate, with usually broad,

triangular to ovate-rotundate, rarely lanceolate blades, and 2 relatively large dorsal pollen-sacs near the base. *Pollen* with 2, rarely 3, wings. *Female strobiles* terminal or axillary, usually reduced to a few sterile lower scales, which are more or less fused with each other and with the axis and 1 or 2 terminal fertile scales, the whole plexus often becoming ultimately fleshy (receptacle) —rarely spike-like with few to numerous usually distant fertile scales; scales spirally arranged or opposite in decussate pairs, the lower often with a foliaceous blade, the upper squamiform; ovules solitary, adnate to the face of the fertile scale, and usually much exceeding it, inverted, and enclosed in a false aril (epimatium) arising from the face of the scale and adnate to the single integument. *Seeds* deciduous together with the fleshy receptacle or with the unmodified remainder of the strobile or falling from the scales of the persistent axis of the strobile; seed-shell (testa) and false aril (rarely also the fertile scale) forming a coriaceous or externally fleshy and internally woody shell. *Embryo* axile; cotyledons 2.

Shrubs or trees, often of great height. Leaves squamiform or linear or lanceolate to ovate, usually spirally arranged, but placed dorsiventrally, rarely opposite. Male strobiles solitary or clustered or disposed in compound inflorescences, rarely apical. Seeds and receptacles, where present, greenish or brown or sometimes vividly coloured, the seeds always conspicuously exposed.

Distrib. About 70 species, mostly in the mountain forests of the Tropics, a few in the Temperate Regions of the Southern Hemisphere and in Japan.

Section 1. Eupodocarpus, Engl.—Axis and scales of the female strobiles mostly transformed during maturation into a fleshy receptacle, or at least thickened and clavate. Inner layer of seed-shell (testa) thin and crustaceous. Sclerenchymatic hypoderma below the upper epidermis continuous; stomata on the lower side of the leaf only (at least in the South African species).

Leaves of the adult tree 1–2½ in. long, straight, shortly acute to almost obtuse; receptacle distinctly fleshy:

- Leaves 3½–6½ lin. wide ... ... (1) **latifolius.**
- Leaves 2 lin. wide ... ... (2) **elongatus.**

Leaves of the adult tree 3–6 in. by 3–4 lin., tapering to a slender acute point; receptacle hardly fleshy, though thickened and clavate ... ... (3) **Henkelii.**

Section 2. Stachycarpus, Endl.—Axis and scales of the female strobiles not transformed during maturation into a fleshy receptacle, the axis ultimately dry with the scales or vestiges of the lower scales. Inner layer of seed-shell (testa) thick and bony. Sclerenchymatic hypoderma below the upper epidermis not continuous; stomata on both sides of the leaf.

Leaves of the mature tree shortly acute to almost obtuse, 1–2 in. by 1¼–2 lin. ; male strobiles 3 4 lin. long, their scales cordate-ovate, more or less obtuse (4) **falcatus.**

Leaves of the mature tree mostly long tapering to a sharp point, 10 lin. to 2 in. by ½–2 lin. :

Leaves 1 2 in. by 1¼–2 lin. ; male strobiles up to 9 lin. long, their scales ovate-triangular, acute (5) **gracilior.**

Leaves 10 lin. by ½–¾ lin. ... ... (6) **gracillimus.**

1. P. latifolius (R. Br. ex Mirb. Geogr. Conif. in Mém. Mus. xiii. 75 ; not of Wall.) ; a tree up to 100 ft. high, with a tall clean bole on the average 2 ft. (sometimes up to 4 ft.) in diameter, and a comparatively small crown ; bark smooth, persistent ; branchlets of the mature tree rather stunted, terete, slightly angular when young, the decurrent leaf-bases soon becoming obliterated ; terminal buds ovoid, up to 2 lin. long ; leaves spirally arranged, loose in the juvenile state, crowded, particularly upwards, and then often subverticillate in the mature state, broad-linear to linear-oblong or oblong, acute to subacute, sometimes apiculate, narrowed at the base into a short petiole, 1–2½ in. by 3½–6½ lin., or in the juvenile state up to 5 in. long, straight or (the juvenile) very slightly falcate, spreading, coriaceous, midrib slightly raised on both sides with 3 resin-ducts below the central strand ; stomata confined to the lower side ; male strobiles solitary, cylindric, ¾–1 in. long, glaucous-pinkish, with a few rotundate-ovate coriaceous very concave bracts about 1 lin. long at the base ; scales imbricate, at length loose, with a rotundate or broad-ovate fimbriate-denticulate or subdenticulate small blade up to ½ lin. long ; pollen sacs ⅔ lin. long, conspicuous ; female strobiles borne on slender peduncles 2½-5 lin. long, formed of 2 decussate pairs of scales fused into a fleshy receptacle, those of one pair barren, slightly shorter, with or without small cuspidate tips, both of the other pair or one only fertile, with a short ovate free blade embracing the base of the ovule, the whole receptacle 2-lobed, and if only one scale fertile more or less to very oblique ; the receptacle when mature resembling a small dark red cherry in colour and shape, up to ½ in. in diam. ; seeds subglobose, 3–3½ lin. in diam., dark glaucous to bluish-green or blue ; inner layer of seed-shell thin crustaceous or almost papery, outer somewhat fleshy, very resinous, 1¼ lin. thick. Bennett, Pl. Javan. Rar. 40 ; C. Presl, Bot. Bemerk. 110 ; Pilger, in Engl. Pflanzenr. Taxac. 90, 91 incl. vars. *latior* and *confertus* ; Engl. Pflanzenw. Afr. i. 421, 422, figs. 361, 362 ; ii. 86, fig. 82 ; Marloth, Fl. S. Afr. i. 101, 102, t. 13, 17 A, and (Suppl.) Dict. Comm. Names of Pl. 101 ; Sim, Fl. Trees & Shrubs for use in South Afr. 182, and Native Timb. South Afr. 101, fig. 41 ; Pilger in Engl. & Prantl, Nat. Pflanzenf. ed. 2, 247, fig. 136 ; Burtt Davy in Kew Bull. 1908, 147, Man. Flow. Pl. Transvaal, 100 ; Levyns, Guide Fl. Cape Penins. 19. *P. Thunbergii*, Hook. in Lond. Journ. Bot. i. 657, t. 22 ; Endl. Syn. Conif. 217 ; Lindl. & Gord. in Journ. Hort. Soc. v. 224 ; Pappe, Silva

Cap. 32 ; Carr. Trait. Conif. ed. i. 470 ; ed. ii. 670 ; Gord., Pinet. ed. i. 284 ; ed. ii. 349 ; Henk. & Hochst. Syn. Nadelhölz., 398 ; Parlat. in DC. Prodr. xvi. ii. 511 ; Fourcade, Rep. Natal Forests, 1889, 4, 121 ; Bolus & Wolley-Dod, Fl. Pl. Cape Penins. in Trans. S. Afr. Phil. Soc. xiv. 320 ; Wood, Handb. Fl. Natal, 122 and in Trans. S. Afr. Phil. Soc. xviii. 224 ; Agr. Journ. Cape Good Hope, xxvi. 170, fig. opp. p. 171 ; Marloth, Kapland, 190, 191, 196, 200, 208, figs. 65, 68, 69, 73 ; Sim, Tree Plant. Natal, 236, 285, 331 ; Bews in Ann. Natal Mus. iii. 545, 547, 548. *P. Thunbergii* var. *latifolia*, Sim, Forest Fl. Cape Good Hope, 3, 332, t. 148, 149, f. 2. *P. macrophyllus*, Drège, Zwei Pflanzengeogr. Doc. 123, 157, 212, not of Don. *P. Sweetii*, C. Presl, Bot. Bemerk. 110. *Taxus latifolia*, Thunb. Prodr. 117 ; Fl. Cap. ed. Schult. 547. *T. macrophylla*, Banks ex Endl. Syn. Conif. 218. *Nageia latifolia*, O. Kuntze, Rev. Gen. ii. 800 ; not of Gord.

South Africa : without locality, *Bowie* ! *Brand* ! *Villet* ! *Millan* ! *Mund and Maire* !

Cape Province : Cape Div. ; Newlands Woods on Table Mountain, *Wolley Dod*, 2729 ! Fritz Bronn's Kraal, *Alexander-Prior* ! Orange Kloof, *Gamble*, 22002 ! Hout Bay, *Bews* ! *Herb. Sim* 19017 ! Swellendam Div. ; Grootvadersbosh, *Thunberg* ; near George, *Burchell*, 5843 ! forests from west of George to the eastern boundary of the division (*Cape Forest Reports*) ; Kaymans River Gat, in forest, *Drège* ! Knysna Div. ; all forest sections of the division (*Cape Forest Reports*); Outeniqua Mountains, *Thunberg* ; Kaatjes Kraal, *Burchell*, 5223 ! 5254 ! Harberville Forest, *Keit*, 524 ! Humansdorp Div, ; forests east as far as Storms River (*Cape Forest Reports* for 1910) ; Uitenhage Div. ; Zuurbergen (*Cape Forest Reports*) ; Albany Div. ; the wooded kloofs near Grahamstown, *Burchell*, 3595 ! *MacOwan*, 1408 ! 1958 ! (*Herb. Sim*) ; *Zeyher*, 3882 ! 3883 ! 3884 ! (*Herb. Sim*) ; *Atherstone*, 89 ! *Burtt Davy*, 7816 ! King Williamstown Div. ; forests of the Perie and North Sections ; Amatola Range (*Cape Forest Reports*) ; Perie forest, *Sim*, 19020 ! Stutterheim Div. ; Koeoghe Range and Isidenge forests (*Cape Forest Reports*) ; " British Kaffraria," *Cooper*, 1298. Fort Cunyngham, 2000–3500 ft., *Herb. Sim*, 2030 ! 2122 !

Eastern Region : Throughout the forests from the Great Kei River and lower White Kei River east to the Drakensberg above Newcastle in Natal and western Zululand (*Cape, Natal & Zululand Forests Reports*) ; Tembuland, Engkobe, Maning, *Merwe, For. Dept. Herb.*, 2266 ! Mkonkoto forest, 3000 ft., *Sim* ! Maclear Div. ; Pot Romer Mountains, 5500 ft., *Galpin*, 6831 ! Pondoland ; Egosa forest, 650–780 ft., *Beyrich* ; and without precise locality, *Bachmann*, 70 ! Mt. Ayliff Div. Tabun River, *Nat. Herb. Pretoria* ! Umzimkulu, Mhlonga forest, *Kaufmann, For. Dept. Herb.*, 2168 ! 2169 ! Jutsubani forest, *Fraser, For. Dept. Herb.*, 2227 !

Natal : Alfred County, near Murchison, *Wood*, 3028 ! near Durban, *Plant* ! Polela Distr., Ingwangwani, Emblazani Forest, *Household, For. Dept. Herb.*, 1957 ! Drakensberg, 3500–4500 ft., *Fourcade* ; north of Van Reenens Pass, 5000–5500 ft. (according to Bews) ; *Rehmann*, 7246 ! 7247 ! on the slopes facing Newcastle, 5000 6000 ft. (according to Bews). Zululand ; Odeni, 4500–5000 ft. and Ingoye forests, 1000–1500 ft. ; and without precise locality, *Gerrard*, 127 ! *Sanderson* !

Swaziland : Forbes Reef bush, 5100, ft. *Burtt Davy*, 2748 !

Orange Free State : Northern slopes of the Drakensberg, *Cooper*.

Transvaal : Middleburg Div. : Kaapsche Hoop, *Rogers*, 21089 ! Lydenburg Div.; forests on the eastern slope of the Drakensberg, east of Pilgrim's Rest, *Legat* 2455 ! Waterberg Div. ; Nylstrom, *Col. Herb.*, 9549 ! Pietersburg Div. ;

The Downs, *Rogers*, 21910! Zoutpansberg Div.; Houtboschberg, 4750 ft., *Burtt Davy*, 1194! 2313! *Houseman, Col. Herb.* 5249! *Botha*!

This tree, commonly known as yellow-wood or Upright Yellow-wood, or Regte Geelhout, is one of the most valuable timber trees of South Africa (see Sim, l.c.). Sim distinguishes 3 varieties, namely—(a) *latifolia*, (b) *angustifolia*, and (c) *falcata*. Vars. *latifolia* and *falcata* are said to have green receptacles 2–3 lin. wide, and seeds 4 lin. in diam., with bony shells, whilst they differ from each other in having leaves 1–2 in. by 2–3 lin., and 2–5 in. by 1½–2 lin. respectively. Var. *angustifolia* on the other hand is credited with red receptacles 3–4 lin. wide and seed 5 lin. in diam., with crustaceous shells and leaves 1–2 in. by 1–1½ lin. From the fact that the author adds that var. *latifolia* is the common form throughout Cape Colony, the Transkei and Lower Pondoland, and is easily recognizable by the short wide leaves standing erect all round the rigid twigs—as seen in his plate, t. 148—it is clear that he means the common form of the tree described here; this, however, has a thin crustaceous seed-shell (testa) and receptacles which become red when ripe (see Marloth's figure in his "Flora of South Africa," t. 17 A). Var. *falcata* is said to be the common form of Upper Pondoland, Griqualand East and Natal. Of this two barren branches are figured in t. 149. The one numbered 2 is described as a robust sapling, and represents certainly the juvenile state of *P. latifolia* as understood here, whilst number 1 is doubtful. Var. *angustifolia* which the author knows only from Robertson Division, is either *P. elongatus* or an undescribed species (see next species). Pilger l.c. admits two varieties, namely, var. *latior* with leaves 2–2½ by 7½–8½ lin., from the Vogelgat Mountains in Caledon Div., *Schlechter*, 9542! and var. *confertus*, with leaves 1–1½ by 4–5½ lin. with broad rounded apiculate tips, from Table Mountain, *Bergius*; *Schlechter*, 3947. Var. *latior* is very striking on account of the unusually broad leaves, which are also somewhat thinner in texture. The specimen seen by me is a ♀ with malformed cones infested with *Corynelia uberata*, Fries, a fungus very frequently found on the South African Podocarpus. Var. *confertus*, on the other hand, comes evidently within the range of ordinary fluctuation characteristic of this species.

2. P. elongatus (L'Hérit. ex Pers. Syn. ii. 580); a tree of varying dimensions, from "small" to 80 ft. high; branchlets of the mature tree elongate, terete, grooved when young, long marked with the decurrent leaf-bases; terminal buds ovoid, small, about 1 lin. long; leaves spirally arranged, in the upper part crowded, and then often subverticillate, linear, mostly acute, rarely subobtuse, very gradually narrowed at the base into an obscure petiole, 1½–2½ in. by 2 lin., straight or slightly falcate, obliquely erect, coriaceous, glaucescent, midrib distinctly raised on the back, obscurely on the upper surface, with 3 resin-ducts below the central strand, stomata confined to the lower side in close rows; male strobiles solitary or in scanty fascicles, cylindric, slender, ⅔–½ in. long, 1½–1¾ lin. in diam., with a few rotundate-ovate coriaceous very concave bracts about 1 lin. long at the base; scales imbricate, soon very loose, with an ovate to rhombic-ovate minutely denticulate blade rather over ½ lin. long; pollen-sacs ½ lin. long; female strobiles borne on slender peduncles 2–5 lin. long and formed of a pair of scales fused with the axis into a fleshy receptacle, scales ovate, unequal, the larger fertile, embracing the base of the ovule, the whole receptacle oblique at the top, 1½ lin. in diam. (in the dry state); seeds subglobose, very slightly longer than wide, 4 lin.

in diam., dark glaucous-green ; inner layer of seed-shell thinly crustaceous. Mirbel, Geogr. Conif. in Mem. Mus. Par. xiii. 75 ; L. C. & A. Rich. Comm. Bot. Conif. (1826) 13, t. i. fig. 2 ; Loudon, Arb. & Frutic. Brit. iv. 2101, fig. 1997 ; Endl. Syn. Conif. 218 ; Lindl. & Gord. in Journ. Hort. Soc. v. 224 ; Carr. Trait. Conif. ed. i. 470 ; ed. ii. 671 (partly) ; Gord. Pinet. ed. i. 273 (partly) ; ed. ii. 334 (partly) ; Henk. & Hochst. Syn. Nadelhölz (partly) ; Parlat. in DC. Prodr. xvi. ii. 511 (partly ?) ; Pilger, in Engl. Pflanzenreich, Taxac. 89 ; and in Engl. & Prantl, Nat. Pflanzenf. ed. 2. 247 ; Edmonds & Marloth, Elem. Bot. S. Afr. fig. 267 (?) (not text) ; Stoneman, Pl. & their Ways S. Afr. fig. 216 (?) (not text) ; Dallimore & Jackson, Handb. Conif. 44. *P. pruinosa*, Meyer ex Endl. l.c. *Taxus elongata*, Thunb. Prodr. 117 ; Fl. Cap. ed. Schult. 547 ; Solander in Ait. Hort. Kew, ed. i. iii. 415 ; ed. ii. v. 416. *T. capensis*, Lam. Encycl. iii. 229. *T. falcata*, Thunb. Herb. ex Juel, Plant. Thunberg, 69.

South Africa : without locality, *Masson* ! *Pappe* ! *Zeyher* 3889 !

Cape Province : Swellendam Div. ; River Zonderend, 400 ft., *Schlechter*, 5682 ! Robertson Div., on sandy islands and banks of the Breede River, *Herb. Forest Dept.* 1247 ! Stellenbosch Div. ; without precise locality, *Miller* ! *Harvey* ! Malmesbury Div. ; Riebeck's Castle, *Thunberg* ; Vleermuys Drift, *Thunberg*. Paarl Div. ; by the Berg River near Paarl, *Drège* ! Worcester Div. ; Dutoit's Kloof, 1000–2000 ft., *Drège* ! Piquetberg Div. ; by the Berg River near Dooreboom, *Bachmann*, 1522, 1523 ; near Vondeling, *Bachmann*, 2211. Clanwilliam Div. ; Kradouw Krantz above the Oliphants River, among rocks in the cliffs, facing west. *Pearson*, 5328 ! *Pillans*, 5297 ! Cedarberg Range, Kaakadouw Kloof, 1150 ft., *Diels*, 937 !

There is a collector's note with the specimen from the Breede river to the effect that the plant differs from *P. elongatus* in its habitat, appearance, and in the more swollen succulent and scarlet "aril," also in the fruit-stalk having two berries ! The specimen agrees exactly with Schlechter's from the Zonderend river and both much resemble *P. elongatus*, except that their leaves show a tendency to become longitudinally wrinkled, which is not observed in the remainder of the herbarium material of *P. elongatus*. The plant is figured in Sim, For. Fl. Cape Good Hope, on t. 149, fig. 3, as *P. Thunbergii* var. *angustifolia* (Sim, l.c. 332). It requires further investigation. The specimen collected by Pillans at the foot of the eastern cliffs of Kradouw Krantz (no. 5297) belongs no doubt to *P. elongatus*, although the leaves are 3½–5 lin. wide and approach those of *P. latifolius* in shape.

In cultivation in England with Mr. Lucas at Lee, Kent, 1777 ! Dr. Salisbury, 1785 ! Dr. Vere in Kensington, 1778 !

From photographs of the Thunbergian originals of this and the following species in the Upsala herbarium, it appears that Thunberg wrote the species up as quoted in Juel, Plantæ Thunbergianæ, that is, *Taxus falcata* for the western and *T. elongata* for the eastern plant, whilst the localities quoted in Thunberg's "Flora Capensis," ed. Schult., connect the western plant with the name *T. elongata* and the eastern with *T. falcata*. The description of the latter and the very name *falcata* as well as its station, "in sylvis" point unmistakably to the name *falcata* having been intended for it, and not for the western plant, which, moreover, was early in cultivation in England under the name *T. elongata*, probably from seeds sent by Masson, who accompanied Thunberg on his journey through the western region when they passed Riebeck's Kasteel and crossed the Berg river at Vleermuys Drift in 1773 or 1774.

3. P. Henkelii (Stapf ex Dallimore & Jackson, Handb. Conif. 15, 47); a tall tree, usually branched from the ground unless when standing in close associations; bark as in *P. latifolius* [Henkel], or in old trees coming off in sheets (*C. Ross*); the young branchlets of the mature tree more or less angular, glaucous; terminal buds globose-ovoid, scales very broad, shortly pointed with brown margins or the tips foliaceous; leaves spirally arranged, loose in the juvenile state, moderately crowded in the mature state, drooping, linear to lanceolate-linear, long tapering to a slender acute point, gradually narrowed at the base into a short petiole, 3–6 in. by 3–4 lin., straight or frequently slightly falcate, suberect or spreading, thinly coriaceous, more or less glaucous, midrib slightly raised on both sides with 3 resin-ducts below the central strand, stomata confined to the lower side; male strobiles solitary or in clusters of up to 5, cylindric, $\frac{3}{4}$–$1\frac{3}{4}$ in. long, glaucous-pinkish, with rotundate-ovate coriaceous bracts, 1 to almost 2 lin. long at the base; scales imbricate, at length loose, with a broad ovate fimbriate-denticulate small blade up to $\frac{1}{2}$ lin. long; pollen sacs $\frac{3}{4}$ lin. long, conspicuous; female strobiles borne on a very short peduncle and formed of a single pair of squamiform bracts fused into a slightly clavate receptacle, one of the bracts barren, with a slightly lower insertion, both very broadly ovate with a short slender tip, the upper, with a narrow membranous denticulate margin, embracing the base of the ovule, the mature receptacle stout, clavate, hardly fleshy, greenish-glaucous with the fertile bract patelliform, the whole up to over 2 lin. by $1\frac{1}{2}$ lin., mature seeds obovoid to ellipsoid, narrowed downwards, 9–10 lin. by 7–9 lin., olive green, inner layer of seed-shell very delicate, hardly separable, brown, the remainder of the shell hard-leathery, and very gritty, more or less resinous, up to 1 lin. thick. Burtt Davy, Man. Flow. Pl. Transvaal, 100, 101. *P. Thunbergii*, Burtt Davy in Transvaal Agr. Journ. 1907, 421. *P. Thunbergii* var. *falcata*, Sim, Tree Plant. Natal 236, 285, fig. 94; Forest Fl. Cape Col. 332 (in part), fig. opp. p. 55, t. cxlix. fig. 1. *P. falcatus*, Marloth, Fl. South Afr.; Suppl. Dict. Comm. Names of Pl. 101; Sim, Fl. Trees & Shrubs f. use in S. Afr. 183, Native Timb. S. Afr. 102, fig. 1; **not of R. Br.**

EASTERN REGION: "British Kaffraria," *Cooper*, 1298! East Griqualand, Mt. Ayliff Div., Fort Donald, *Sim, Nat. Herb.*, 19016! *Cockrane*! Gwaleni forest, *Cockrane in Forest Dept. Herb.*, 2172! *Forest Dept. Herb.*, 1248! Pondoland: Flagstaff Div.; Tonti Forest, Whibley, *Forest Dept. Herb.*, 2167! Coll.(?) in *Forest Dept. Herb.*, 1249!

NATAL: Polela Div.: Riverside, *Dawson*! *Kaufmann, For. Dept. Herb.*, 2170! 2171! Ingwangwane, Xalingena Forest, *Houshold, Forest Dept. Herb.*, 1947! 1948! Emkazeni Reserve, *Houshold, Forest Dept. Herb.*, 1880! Pietermaritzburg Div.; Zwartkop, 4000 ft., *Sim, Nat. Herb.*, 19007! Blinkwater, 3000 ft., *Sim, Nat. Herb.*, 19014! Karkloof, 3000 ft., *Sim*, 19019! Maritzburg, 2300 ft., *Sim, Nat. Herb.*, 19011! 1912! 1913! and without precise locality, *Henkel, Forest Dept. Herb.*, 2331a & b.

SWAZILAND: Forbes Reef Bush, 5100 ft., *Burtt Davy*, 2738a!

TRANSVAAL: Barberton, *Legat*, 3467! Pietersburg Distr.; Houtboschberg, *Nelson*, 420!

According to Mr. Henkel, this constitutes nearly 90% of the growing stock in some of the Natal forests. He also states that the tree extends westwards into the Transkei region, whilst it does not appear to cross the Tugela river in the east. It corresponds probably to a great extent to the *Podocarpus falcatus* (Falcate Yellow-wood) of the Natal Forestry Reports. The difference in the structure of the seed-shell of *P. Henkelii* and *P. falcatus* is very striking. **Native name** *um-Sonti* or *um-Sunti*.

4. P. falcatus (R. Br. ex Mirb. Geogr. Conif. in Mém. Mus. Par. xiii. (1825) 75); a tall tree up to over 100 ft. high, with a straight cylindrical bole about 3 ft. (sometimes 8 ft.) in diam.; ultimate branchlets of the mature tree stunted, crowded, terete or more or less angular from the decurrent leaf-bases when young; terminal buds ovoid, up to 1 lin. long; leaves in the juvenile tree loose, conspicuously plagiotropic, often subopposite, linear, acute, straight or slightly falcate, up to 3½ in. by 1½ in.–3 lin., drying dark green or brown, moderately thick, in the mature tree crowded, scattered, not plagiotropic, linear to lanceolate- or oblong-linear, subacute or those towards the base of the branchlets subobtuse or obtuse, 1–1½ in. by 1½–2 lin., straight or nearly so, firmly coriaceous, drying dark or pale green, midrib indistinct on the upper side, slightly raised below, with 1 resin-duct below the central strand; stomata on both sides; male strobiles solitary or in subsessile clusters of 2 or 3 or more, cylindric, 3–4 lin. long, 1 lin. thick, each supported by broad-obovate obtuse bracts; scales imbricate, with a cordate-ovate subdenticulate blade, ⅔ lin. long; pollen-sacs almost ½ lin. long; female strobiles (only seen in the mature and semi-mature state) peduncled, formed of a short stipe which does not ultimately become fleshy and 2 or 3 subcoriaceous rotundate-ovate obtuse scales up to 1 lin. long, all deciduous except the uppermost, which supports a seed; peduncles about 3 lin. long, marked with the scars of early deciduous coriaceous rotundate-ovate or sometimes leaf-like bracts; seeds more or less globose, about 6 (rarely up to 9) lin. in diameter, glaucous-green; inner layer of seed-shell very hard, bony, tubercled, outer somewhat fleshy, very resinous inwards. Endl. Syn. Conif. 219; Lindl. & Gord. in Journ. Hort. Soc. v. 224; Carr. Trait. Conif. ed. i. 472; ed. ii. 670; Gord. Pinet. ed. i. 286; ed. ii. 336; Henk. & Hochst. Syn. Nadelhölz. 400; Parl. in DC. Prodr. xvi. ii. 511; Pilg. in Engl. Pflanzenreich, iv. v. Taxac. 72; Cape Forest Report, 1906, plates opposite pp. iv. and 18; 1907, plate opposite p. 4; Burtt Davy in Kew Bull. 1908, 147, and Man. Flow. Pl. & Ferns Transvaal, 101; Dallimore & Jackson, Handb. Conif. ed. 2, p. 44; Wilson, Plant Hunt. i. 25, t. 4 and in Journ. Arnold Arbor. ix. 145, t. 14. *P. meyeriana*, Endl. l.c. 218; Parl. l.c. 512; Marloth, Kapland, 206. *P. elongata*, Pappe, Silva Cap. 32; Carr. Trait. Conif. ed. ii. 671 (partly); Fourcade, Rep. Natal For. 1889, 4 (4, 121); Burtt Davy in Transvaal Agric. Journ. 1907, 421 (?); Edmonds & Marloth, Elem. Bot. S. Afr. 172, fig. 267-1 (not fig. 267–ii, iii); Engl. Pflanzenw. Ost.-Afr. C. t. 1, figs. C–H; Sim, Tree Plant. Natal, 236, 285; For. Fl. Cape Col. 332, t. cl. and in

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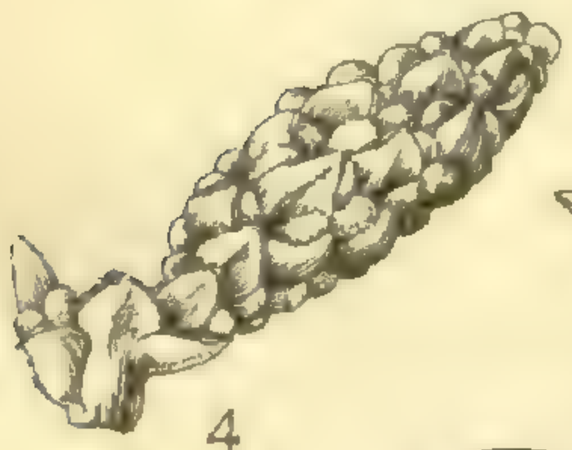

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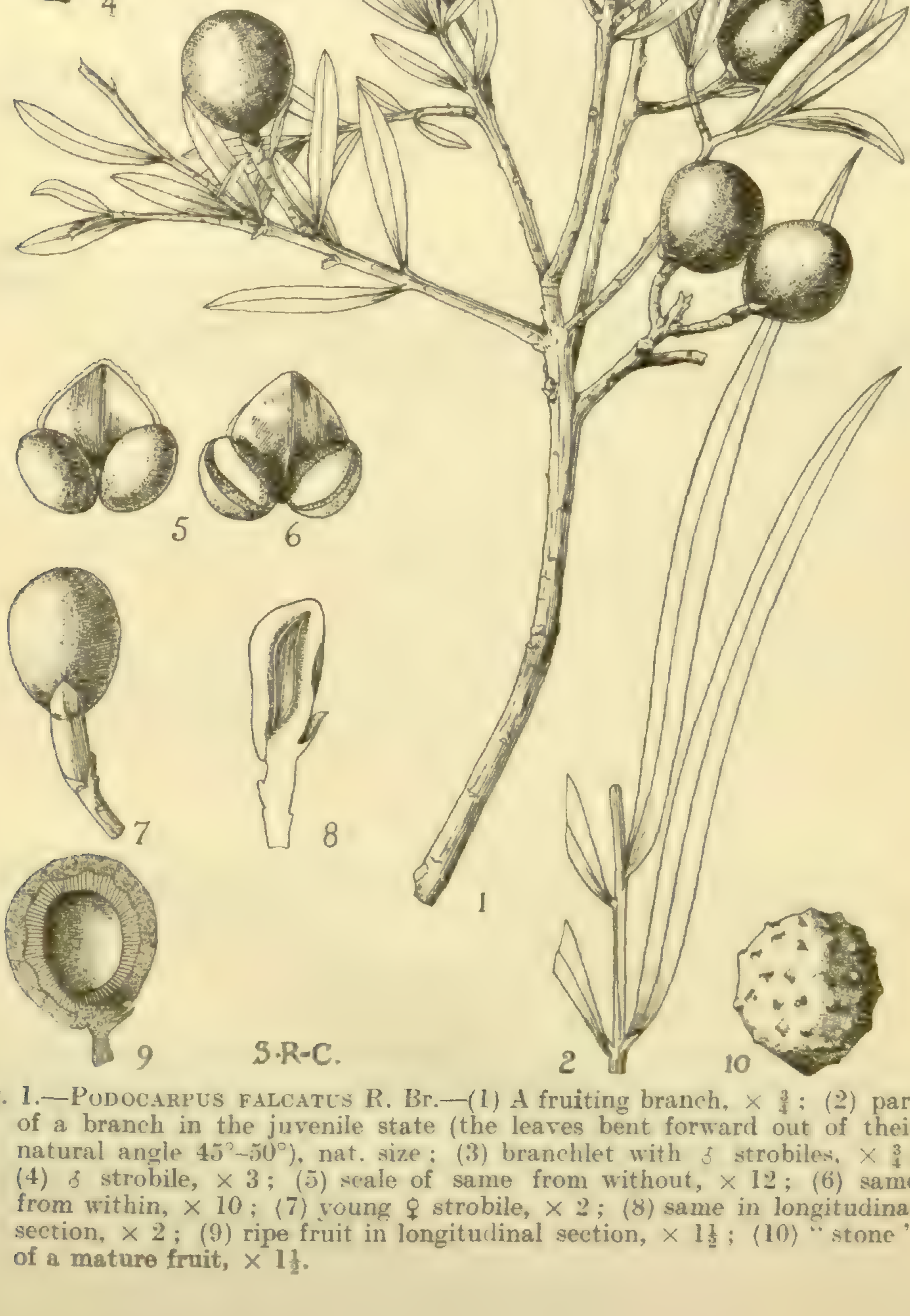

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Fig. 1.—PODOCARPUS FALCATUS R. Br.—(1) A fruiting branch, × ¾; (2) part of a branch in the juvenile state (the leaves bent forward out of their natural angle 45°–50°), nat. size; (3) branchlet with ♂ strobiles, × ¾; (4) ♂ strobile, × 3; (5) scale of same from without, × 12; (6) same from within, × 10; (7) young ♀ strobile, × 2; (8) same in longitudinal section, × 2; (9) ripe fruit in longitudinal section, × 1½; (10) "stone" of a mature fruit, × 1½.

For. Fl. & For. Resourc. Portug. East Afr. 108, t. 97 A ; and Fl. Trees & Shrubs S. Afr. 182, and Native Timb. S. Afr. 100, fig. 42 ; Wood, Handb. Fl. Natal, 122, and in Trans. S. Afr. Phil. Soc. xviii. 224 ; Marloth, Kapland, 190, 191, 197, 208, 402 ; Fl. South Afr. i. 101, t. 18 & Suppl. ; Dict. Comm. Names of Pl. 101 ; Stoneman, Plants & their Ways S. Afr. ed. ii. 242, fig. 215 (not 216), not of L'Hér. *Taxus falcata*, Thunb. Prodr. 117 ; Fl. Cap. ed. Schult. 547. *T. elongata*, Thunb. Herb. ex Juel, Pl. Thunb. 69.

South Africa : Without locality, *Masson* ! *Heward* ! *Mund & Maire* !

Cape Province : Swellendam Div. ; Grootvadersbosch, *For. Dept. Herb.*, 1369 ! George Div. ; Sylvan Station near George, *Burchell*, 6068 ! Kaymans Gat River, *Drège* ! Touw River, *Burchell*, 5761 ! Bier Vlei and Hooge Kraal Forest Sections (*Cape Forest Reports*). Knysna Div. ; throughout the division (*Cape Forest Reports*) ; Plettenberg Bay, *Bowie* ! Gowna, *Forst. Dept. Herb.* 1246 ! Kaatjes Kraal, *Burchell*, 5245 ! Vander Wats, *Burchell*, 5293 ! and without precise locality, *For. Dept. Herb.*, 1244 ! Humansdorp Div. ; Lattering, Storms River and Wit Els Bosch Sections (*Cape Forest Reports*) ; Hankey, *Fourcade*, 3319 ! Uitenhage Div. ; Van Staadens River, *Burchell*, 4652 ! Enon, *Drège* ! Zwartkops River, *Alexander Prior* ! Alexandria Div. ; without precise locality (*Cape Forest Reports*) ; East London, *O. Kuntze* ! Albany Div. Alicedale, *Pulgrave, For. Dept. Herb.*, 2689 ! Queenstown Div. ; Junction Farm, *Galpin*, 8179 ! Bongolo Neck, *Galpin*, 7973 ! Stutterheim Div. ; Kologha, Isidenze and Quacu Sections (*Cape Forest Reports*). King Williamstown Div. ; Everlyn Valley, Iselini, Donsal and Pirie Sections (*Cape Forest Reports*). British Kaffraria, *Cooper*, 1297 ! Somerset East Div. ; Boschberg, *Burchell*, 3174 ! 3189 ! *MacOwan*, 1561 !

Eastern Region : Transkei and Pondoland ; Kentani, Butterworth, Tsomo, Willowvale, Engcoba Umtatu, St. Marks, Elliot and Flagstaff Divisions (*Cape Forest Reports*) ; and without precise locality, *Bachmann*, 74. Engcobe, Manina, Merwe, *For. Dept. Herb.* 2268 ! 2269 ! Lusikisiki Div., Jntsubani, *Fraser*, 62 A ! *For. Dept. Herb.* 2226 ! Griqualand East ; Tsolo, Gumbu, Mt. Frere, Matatida and Mt. Currie Divisions (*Cape Forest Reports*).

Natal : From the coast to the Drakensberg above Newcastle (*Natal Forest Report*) ; near Durban, *Sanderson*, 3015 ! *Wood*, 3005 ! Polela Div. ; Ingwangene, Emkazeni forest, *Houshold*, For. Dept. Herb. 1949 ! 1956 ! Drakensbergen, *Rehmann*, 6482 ! Zululand ; Guadeni forest between Tuzela and Insuzt rivers, 4500-5000 ft., and Ingwone forest between Mhlatuzuna and Msabazi rivers, 100-1500 ft., abundant (*Natal Forest Report*) ; Eshowe, Manga forest, Ballenden, *For. Dept. Herb.* 2925 !

Portuguese East Africa : Lourenço Marques ; Lebombo range in kloofs near Estatuene, *Sim.*

Transvaal : Pietersburg Div., Houtbosch Berg, *Rehmann*, 6481 (see also the references to Mr. Rogers's specimen from "The Downs," no. 20210 ! under *P. gracilior*).

British Bechuanaland : Stellaland, in forests to the north and south of Genesa (*Cape Forest Report*, 1895, 183).

This is the Outeniqua or Bastard Yellow-wood or Geelhout of South African foresters. Though locally frequent, it is on the whole much less common than the Upright or true Yellow-wood, the two Yellow woods together supplying nearly one-half of the indigenous timber (Marloth, *Fl. South Afr.* i, 101). It may be remarked that some of the localities quoted above for the eastern part of the area on the authority of the Cape Forest Reports refer possibly to *P. Henkelii*, with which *P. falcata* was confused for a long time.

5. P. gracilior (Pilger in Engl. Pflanzenreich, iv. v. Taxac. 71); a tall tree up to 100 ft. or more high with a bole over 4 ft. in diam.; ultimate branchlets of the mature tree crowded, angular from the decurrent leaf-bases when young; terminal buds ovoid, $\frac{1}{2}$-$\frac{3}{4}$ lin. long; leaves in the juvenile tree loose, conspicuously plagiotropic, often subopposite, linear, long tapering to an acute point, straight or slightly falcate, up to 4 in. by 3 lin., moderately thick, in the mature tree crowded, scattered, not plagiotropic, linear, usually long and gently tapering to a sharp point, rarely shortly acute, 1–2 in. by $\frac{1}{4}$–2 lin., coriaceous, drying dull green or brownish, mid-rib indistinct above, slightly raised below; male strobiles solitary or in subsessile clusters of 2 or 3, supported by broad roundish bracts, often up to 9 lin. and occasionally over 1 in. long; scales imbricate, with a broadly ovate-triangular acute blade, $\frac{1}{2}$ lin. long; female strobiles sessile at the end of short branchlets, carrying reduced and often early deciduous leaves, the strobiles formed of a short axis, 1–1$\frac{1}{2}$ lin. long, with 1–3 barren short ultimately deciduous scales, dry and appressed or sometimes foliaceous, spreading and recurved, the uppermost supporting an ovule; seeds ellipsoid-globose, rounded or slightly attenuated at the base, 7–10 lin. long, 6–8 lin. across, glaucous-green to purplish-brown; inner layer of seed-shell very hard, bony, slightly tubercled, up to 1 lin. thick, outer usually thinner and dry or sometimes as thick as the inner and slightly fleshy, resinous inwards. Engl. Pflanzenwelt Afr. iv. v. 86, fig. 86, and Veget. Hara and Gallahochl. 11 (sphalm. *P. gracilis*); Pilger in Engl. & Prantl, Nat. Pflanzenf. ed. 2, p. 245, fig. 131); Burtt Davy, Flow. Pl. Transvaal, i. 101. *P. elongata*, A. Rich. Tent. Fl. Abyss. ii. 278; Engl. Hochgebirgsfl. Trop. Afr. 109; Pfl. Ost.-Afr. C. 92, t. i. fig. B (not C–G); Oliv. in Journ. Linn Soc. Bot. xxi. 404 (as forma ?); Hutchins, Forests of Kenia in Col. Rep. Miscell. no. 41, 17; not of L'Hérit. *P. falcata*, Engl. in Hochgebirgsfl. Trop. Afr. l.c. and Veget. Usambara, 68; Pirotta in Ann. Ist. Bot. Roma, vi. 156; not of R. Br. *Taxus elongata* Roth, in Harris, Highl. Aeth. ii. 708; not of Ait.

Transvaal: Zoutpansberg, *Houseman*, *Col. Herb.*, 5248! Pietersburg Dist.; The Downs, *Rogers*, 20210! (juvenile form).

Apparently throughout eastern tropical Africa as far as Abyssinia.

Podocarpus gracilior resembles *P. falcatus* so much that it has for a long time been considered identical with it. Both exhibit a wide range of variation in their foliage according to its age and position in the tree, the leaves becoming smaller and more crowded as the tree reaches maturity, particularly so in the flowering parts, and at the same time attaining more of the characters which, as well as the floral and fruit-characters, are distinctive of the two species. As the progress of transition from juvenile to adult stages is never quite even, and individual trees or individual branches of one tree often lag behind or behave precociously, barren specimens taken at random from a tree and distributed without explanatory notes are not always identifiable with certainty. But as, moreover, the diagnostic characters even in complete specimens are never very pronounced, *P. gracilior* and *P. falcatus* may with some show of reason be considered as geographical subspecies or varieties of a *P. falcatus* in

a broad sense, *P. gracilior* being typical of the tropical parts of the common area and *P. falcatus* proper of extratropical South Africa with occasional linkages in one or the other direction. Houseman's specimen from Zoutpansberg (a fair-sized branch with adult foliage and a detached fruit, referred here to *P. gracilior*, agrees exactly in its foliage with typical specimens of this species from Kenya (*Hutchins*, no. 598), whilst the fruit is rather large with the outer layer of its shell too soft for typical *P. gracilior*; but it has, on the other hand, almost its counterpart in specimens of *P. falcatus* collected by Fourcade in the Humansdorp Division, Cape Province. The determination of this specimen therefore remains somewhat doubtful for the present, and the same applies to Rogers's specimen from The Downs, which is in the juvenile state.

6. **P. gracillimus** (Stapf in Prain, Fl. Trop. Afr. vi. ii. 343); a tree of great height (a "mammoth tree," according to Nelson), only known from a few branchlets in the adult state and some immature cones; branchlets slender; leaves densely crowded, sessile or subsessile, linear, about equally attenuated at both ends, or the tips more so and very acute, straight or very slightly curved, up to 10 lin. by $\frac{1}{2}$–$\frac{3}{4}$ lin., coriaceous, midrib obscure on both sides, particularly on the upper. Male and female strobiles unknown; seeds (immature) globose, about 5 lin. in diam., supported by the moderately stout axis of the strobile, which is about $1\frac{1}{2}$ lin. long and bears the scars of 1 or 2 barren scales, and by the fertile scale which is ovate-triangular, $\frac{1}{2}$ lin. long and closely appressed to the seed. Burtt Davy, Man. Flow. Pl. Transvaal, i. 100, 101.

Transvaal: Houtboschberg, *Nelson*, 423! *Burtt Davy*, 5083.

A very doubtful and incompletely known species. It may represent merely a state of *P. gracilior*, in which the reduction of the leaves in length and breadth characteristic of the fruiting stage has been carried to excess. Sim has already suggested this explanation. A similar state was collected by A. Whyte in the Eldama ravine, Kenya, along with typical *P. gracilior*.

Order CXXVII. B. **CUPRESSACEÆ.**

(By O. Stapf.)

Monœcious or occasionally dicœcious. *Strobiles* small, mostly solitary and terminal. *Male strobiles*: scales opposite or in whorls of 3, squamiform and more or less shield-shaped, bearing basi-dorsally 2–6 pollen-sacs; pollen grains without vesicular appendages. *Female strobiles*: scales few to many, all or most fertile, bearing basi-dorsally erect ovules, rarely all barren and surrounding a few terminal ovules. *Fruiting strobiles* developed as typical "cones" with enlarged leathery or woody valvate or imbricate and finally gaping scales, rarely fleshy and berry-like (galbules). *Seeds* free, rarely united in a stone, mostly with wing-like expansions of the crustaceous to woody testa; cotyledons 2, rarely 3–6.

Shrubs or trees; leaves spirally arranged in the juvenile state and on the long-shoots, otherwise decussate and in whorls of 3, the juvenile needle-shaped, the adult usually small, squamiform and more or less appressed, rarely both, the juvenile and the adult, needle-shaped and spreading.

Distrib. Genera about 15 with 125 species, of these 7 genera with over 40 species in the Southern Hemisphere; 1 in South Africa.

I. WIDDRINGTONIA, Endl. Gen. Plant. Suppl. II. 25 (1842).

Monœcious (always ?) *Male strobiles* small, terminal, mostly on short lateral branchlets; scales decussate, rhomboid-deltoid, produced into a beak or (upper scales) a short point or obtuse, with 2 pollen-sacs at the base. *Female strobiles* small, scattered along elongated shoots, singly or in dense clusters, rarely racemose; scales opposite in 2 alternating pairs, divaricate at the time of pollination, then closing up, corky-coriaceous, apiculate; ovules 3 or more at the base of each scale. *Mature strobiles* or *cones* woody, ovoid or globose, opening with 4 very thick erect valves, corresponding to the 4 scales. *Seeds* free, ovoid or trigonous, winged; testa crustaceous. *Cotyledons* 2.

Evergreen trees; leaves passing from a spiral arrangement in the juvenile state and in the long-shoots to a strictly decussate arrangement in the adult state, needle-shaped in the juvenile form, squamiform and tightly appressed in the adult; cones the size of a small plum, usually clustered.

Distrib. Species 6 in South Africa, one of them also in Southern Tropical Africa.

Ovules 6–10 with each scale; maturing seeds up to over 30 in a cone; pollen-sacs protruding between the scales:

Mature cones globose-ovoid or obversely pear-shaped (when closed), up to 7 lin. in diam., smooth or blistered (but not tubercled), subapical cusps usually marked and pointed:

Cones distinctly stipitate with the stipe up to 3 lin. long, obversely pear-shaped, with a narrow top and with the cusps unequally distant from the centre of the top; mature seeds up to 36, up to 5 lin. by 1½ lin. at the middle, wing up to 2½ lin. wide below the top; ultimate and often also the penultimate ramifications of the branches terete, very slender, ⅓–½ lin. in diam., their scale-leaves rhombic-oblong, acute or subobtuse, 1 lin. long ... ... (1) **stipitata.**

Cones sessile or subsessile, globose-ovoid with a broad truncate top and cusps about equally distant from the centre of the top; mature seeds up to 18, up to over 6 lin. by 2 lin. at the middle, wing up to 3½ lin. wide below the top; ultimate and penultimate ramifications terete to subquadrangular, ½ lin. in diam., their scale-leaves rhombic, mostly ¾ lin. long (2) **Whytei.**

Mature cones (before opening) globose, up to 9 lin. in diam., **smooth, subapicular cusps** (or at least two of them distant from the top), usually short and blunt or almost obliterated; mature seeds up to over 20, 5–6 lin. long, including the **often oblique wings**; **scales of the ♂ strobile** delicate, except the sometimes subcoriaceous **acumen** ... ... **(3) cupressoides.**

Ovules 3-4 with each scale; maturing seeds up to 12 (rarely 14) in a cone; pollen-sacs covered by the scales:

Mature cones not tubercled along the margins of the **valves, but more or less wrinkled all over**; **seeds rather flat, 3½-4 lin. long, equally winged on** both sides, wings meeting at the apex in a notch, up to 1 lin. wide; a shrub or small tree ... (4) **dracomontana.**

Mature cones coarsely tubercled along the margins of the valves; trees, sometimes of considerable size:

Seeds rather flat, 4-6 lin. long, including the wings which join over the apex and are there up to **2½ lin. wide** ... ... (5) **Schwarzii.**

Seeds plump, more or less triquetrously ovoid, **4 lin. long, with a very narrow wing along 2** of the angles and over the tip ... ... (6) **juniperoides.**

1. W. stipitata (Stapf in Hook. Ic. Plant. t. 3126); a tree of the habit of *W. Whytei*; juvenile state unknown; ultimate ramifications very slender, cylindric, about ⅓ lin. in diam.; leaves of the adult state decussate, squamiform; those of the long and intermediate branches distant by their own length, subappressed, lanceolate or acuminate, base adnate with parallel margins about 1 lin. long, those of the ultimate and often also of the penultimate ramifications tightly appressed, rhombic-oblong from a cuneate base, acute or subobtuse, 1 lin. long, rounded on the back, with the free portion as long or nearly as long as the adnate; male strobiles coetaneous (always ?) with the mature cones, shortly cylindric, up to 2 lin. long, sessile; scales in about 6 pairs, broadly rhomboid, subacute to acute, ½ lin. long and wide, transversely depressed below the middle, pollen-sacs 4, protruding between the scales; female strobiles unknown in the flowering state; cones in loose racemose clusters of 3–5 with a rhachis up to over 1 in. long, borne on a stout stipe up to 3 lin. long, chestnut brown, very pruinose towards the base, when closed inversely pear-shaped, obtuse, with 4 often pungent cusps, 10 lin. long, up to 7½ lin. in diameter below the middle; valves more or less unequal, two ovate-oblong, up to 5½ lin. wide, two linear-oblong, up to 4 lin. wide, all usually obtuse, smooth, their cusps unequally distant from the top; seeds up to 36, dark-brown, obovate-oblong, or oblong, with a terminal, oblong, emarginate wing, 4½–5 lin. long, the body of the seed ovate-lanceo-

late, beaked, about 3 lin. long, 1½ lin. wide, the wing up to 2½ lin. wide below the top.

TRANSVAAL: Zoutpansberg, *Kotze* in *Forest Dept. Herb.*, 7048! *H. Hansen*, 7313!

The specimens from which this species was described were taken from a tree in Mr. Hansen's garden at Piet Retief, which, according to Mr. Kotze, was obtained from the farm "Hillside," near Louis Trichardt, but specimens received from there proved to be *W. Whytei*.

2. **W. Whytei** (Rendle in Trans. Linn. Soc. ser. 2, Bot. iv. 60, t. 9, figs. 6–11); a shrub or small tree, in the Transvaal, or up to 140 ft. high in the Tropics; trunk up to over 5 ft. in diam., top wide, loose; ultimate ramifications of the adult plant slender, cylindric or subquadrangular, about ½ lin. in diam.; leaves of juvenile state acicular, up to 1 in. by ½–1 lin., of adult state squamiform, those of the long and intermediate branches with a lanceolate acuminate or oblong to ovate and acute somewhat spreading or appressed free blade, 2–1 lin. long, and a broad adnate base with more or less parallel margins; those of the ultimate and sometimes also of the penultimate divisions tightly appressed (so that the contour of the branchlets is an approximately straight line or more often wavy), rhombic, about ½ lin. long or slightly shorter, subacute at both ends, the free and the adnate portions about equally long, slightly keeled or rounded on the back, with 1–3 slender resin-ducts, which are usually not visible externally; male strobiles cylindric-oblong, 1½–2 lin. long, ebracteate and subsessile in the cup formed by the subtending foliage leaves; scales in about 6 pairs, coriaceous, subpeltate, the lower deltoid, with a distinct hard beak, the upper more rounded and minutely apiculate; pollen-sacs 4, protruding between the scales; female strobiles in short subsessile often much reduced spikes, terminating with a vegetative bud and 2½–5 lin. long; strobiles at the time of pollination 1½ lin. across, equalling or exceeding the subtending squamiform broad-ovate acuminate bract; scales ovate, apiculate, face bluish-pruinose, back and margins greenish-brown; ovules up to 5 with each scale; cones (when closed) globose-ovoid with a broad truncate top and often pungent cusps, 9–10 lin. long, 7 8 lin. across, somewhat pruinose and resinous; valves slightly spreading, their cusps about equally distant from the top; seeds up to 10, obovate to obovate-oblong, up to 6 lin. by 2½ lin., dark-brown, the body ovate-lanceolate in outline, beaked, 3–3½ lin. long, the wing up to 3½ lin. wide below the top. Masters in Gard. Chron. 1894, xv. 746; 1894, xvi. 190, and 1905, xxxvii. 18; in Nature, 1894, 85; in Journ. Linn. Soc. Bot. xxxvii. 270; Whyte in Kew Bulletin, 1895, 189; Gard. Chron. ser. 3, xxxiii. 162; xxxvii. 18; McClounie in Kew Bulletin, 1896, 216; Rendle in Journ. Linn. Soc. Bot. xl. 235; Dallimore in Kew Bulletin, 1913, 224; Burkill in Johnston, Brit. Centr. Afr. 279; Sim, Forest Fl. Portug. East Afr. 109; Stapf

in Prain, Fl. Trop. Afr. vi. Sect. 2, pt. 2, 334 ; L. H. Bailey, Cult. Evergreens, 231 ; Burtt Davy, Man. Flow. Pl. & Ferns Transvaal, i. 102 ; Pilger in Engl. & Prantl, Pflanzenf. Ed. 2, xiii. 383 ; Dallimore & Jackson, Handb. Conif. 541 ; Chalk & Davy, Forest Trees & Timb. Brit. Emp. i. 12 with fig. and t. opp. 18. *W. Mahonii*, Mast. in Journ. Linn. Soc. London, Bot. xxxvii. 271 ; Sim, Forest Fl. Portug. East Afr. 109. *Callitris Mahonii*, Engl. Pflanzenwelt Afr. ii. 88. *C. Whytei*, Engl. l.c. 89 ; Eyles in Trans. R. Soc. South Afr. t. 292.

TRANSVAAL : Lydenburg Distr., *Oranje, For. Dept. Herb.*, 340. Zoutpansberg Distr. ; Blaauwberg, common in a kloof at the summit, *Houseman* ! *C. E. Gray* in *Col. Herb.*, 4575 ! Hanglip, 3½ miles west of Louis Trichardt, *For. Dept. Herb.*, 7298 ! 5 miles west of Wylie's Poort, 4800 ft., on steep rocky slopes, *Hutchinson & Gillet*, 4410 ! Pietersburg Distr. ; summit of the Wolkberg, near Haenertsburg, 5000-5200 ft., *Lewis* in *Col. Herb.*, 3597 ! 4310 !

Extending northwards into tropical Africa as far as Nyasaland.

3. W. cupressoides (Endl. Cat. Hort. Vindob. i. 209, and Syn. Conif. 33) ; a rather compact shrub with fastigiate branches, 6–12 ft. high, rarely a tree with a trunk up to 1 ft. in diam. (according to Fourcade), in cultivation, according to Carrière, up to almost 50 ft. high with strictly erect branches ; ultimate ramification of the adult plant almost cylindric, the barren twigs slender, up to ½ lin. in diam. ; leaves of the juvenile state needle-shape, spreading, up to 10 lin. by ¾ lin., glaucous below or quite green (cultivated specimens) ; of adult state decussate, squamiform, those of the older branches with an ovate acute usually appressed blade, the free portion about 1 lin. long, those of the ultimate divisions tightly appressed (so that the contour of the branchlet is approximately a straight line or in the upper part more or less wavy), ovate-oblong to rhombic-oblong, ⅔ ¾ lin. long, subacute at both ends, but less so at the lower, free and adnate portions about equally long, sometimes obscurely keeled on the rounded back ; male strobiles oblong to ovoid, about 1 lin. long, ebracteate and subsessile in the cup formed by the subtending foliage leaves ; scales in about 6 pairs, peltate, rhombic, subacuminate, delicately scarious except the frequently subcoriaceous acumen, the subhyaline margins minutely denticulate ; pollen-sacs 4, protruding between the scales, female strobiles in slender loose spikes, ⅓ to over 1 in. long and terminating with a vegetative bud ; strobiles at the time of pollination up to 1½ lin. across, exceeding the subtending squamiform broad-ovate acute bract ; scales ovate, acute or minutely apiculate, stout with a large hump on the face, this and the base of the back bluish-pruinose, otherwise greenish-brown ; ovules 6–7 with each scale, bottle-shaped with 2 distinct equal wings ; cones 1–4 in a spike, rather close, globose, up to 1 in. in diam., blackish-brown, somewhat pruinose and resinous ; valves smooth, rarely slightly and irregularly

Fig. 2.—WIDDRINGTONIA CUPRESSOIDES Endl.—(1) A cone-bearing branch, × ⅔; (2) a branchlet of the juvenile state, × ½; (3) part of a branchlet of the adult state, × 10; (4) a scale-leaf of same, seen from within, showing how far it was adnate to the axis (white), × 10; (5) two ♂ strobiles, × 7; (6) scale of a ♂ strobile, × 15; (7) same seen from within, × 15; (8) a ♀ inflorescence, × 2; (9) a ♀ strobile, ready for pollination, × 5; (10) a scale of same with ovules at the base, × 5; (11) and (12), ovules, × 20; (13) valve of a mature cone, showing scars of shed seeds, nat. size; (14) and (15) seeds, nat. size.

tubercled with a short often blunt point (the morphological apex) some distance below the top; seeds up to 20 or more, somewhat compressed, lanceolate to ovate-lanceolate in outline, $3\frac{1}{2}$–5 lin. long, broadly winged upwards, with the wings obovoid, emarginate, often very oblique, and 5 to over 6 lin. long, black with a silky lustre or the wings dark brown. Lindl. & Gord. in Journ. Hort. Soc. V. 203; Knight, Syn. Conif. 13; Pappe, Silv. Cap. 31; Carr. Trait. Conif. ed. i. 64; ed. ii. 518; Gord. Pinet. ed. i. 333; ed. ii. 417; Schlechtend. in Linnaea, xxxiii. 361, t. i. fig. 1; Henk. & Hochst. Syn. Nadelhölz. 293; Sperk in Mém. Acad. Sc. St. Petersb. Ser. 7, XIII. no. 6, t. 5, fig. 132-135; Parlat. in DC. Prodr. XVI. ii. 443; Sim, For. Fl. Cape Col. 337, and Native Timb. S. Afr. 131, t. 27; Bolus & Wolley Dod, Fl. Cape Penins. (in Trans. S. Afr. Phil. Soc. XIV. 320) 1903; Mast. in Journ. Linn. Soc. xxviii. 270; Saxton in Bot. Gaz. xlviii. 161–178, fig. 2, t. xi; Marloth, Fl. S. Afr. i. 101, fig. 67, a. *Cupressus juniperoides*, Linn. Sp. Pl. ed. ii, 1422; Ait. Hort. Kew. ed. i, iii. 373; Harvey, Gen. S. Afr. Pl. ed. i. 311. *C. africana*, Herm. & Oldenland ex Mill. Gard. Dict. ed. viii; Hook, f. in Lond. Journ. Bot. iv. 141. *Thuja cupressoides*, Linn. Mant. i. 125; Mant. ii. 518; Thunb. Prodr. 110; Fl. Cap. ed. Schult. 500; Ait. Hort. Kew, ed. ii. v. 322; Willd. Sp. Pl. v. 510; Loudon, Arb. Brit. iv. 2460, fig. 2316; Harvey, Gen. S. Afr. Pl. ed. i. 311. *T. sp. n.?* Barrow, Travels S. Afr. i. 298. *Juniperus capensis*, Lam. Encycl. ii. 626. *Schubertia capensis*, Spreng. Syst. iii. 890. *Pachylepsis cupressoides*, Brogn. in Ann. Sc. Nat. 1re sér. xxx. 190; Spach, Hist. Nat. Veg. xi. 346; Krauss in Flora, xxvii. 272; xxviii. 89. *Callitris cupressoides*, Schrad. in Drège, Zwei Pflanzengeogr. Doc. 79, 115, 126, 170; Pappe, Fl. Cap. Med. Prodr. ed. i. 26; ed. ii. 37; Engl. Notizbl. Bot. Gart. Berlin, App. xi. 28, and Pflanzenw. Afr. ii. 88; Marloth, Kapland, 116, 196, 199; Bolus & Wolley-Dod in Trans. S. Afr. Phil. Soc. xiv. 320; Dallimore & Jackson, Handb. Conif. 540. *Cupressus aethiopica coronata* . . . Breyne, Prodr. Fasc. Rar. Pl. 39; ed. 2, p. 59. *C. nana compressis Taxi longioribus foliis Afric.*, Pluk. Almag. Mant. 61. *C. africana lini folio*, Burmann, Cat. Pl. Afr. Herm. 8. *Juniperus foliis frutex Afr.*, Pluk. Phyt. t. 197, fig. 5; Almag. 202.

Cape Province: Cape Div.; Table Mountain plateau, *Wilms*, 3636! between Rondebosch and Wynberg, *Burchell*, 771! Orange Kloof, *Gamble*, 22013! Constantia, *Thunberg*, *Krause*, and without precise locality, *Kiggelaer*! *Masson*! *Harvey*, 419, *Thom*, 163! *O. Kuntze*! Worcester Div.; Dutoits Kloof. 1000-2000 ft., *Drège*. Caledon Div.; Caledon, *Smith*! Genadendal, 2000-3000 ft., *Drège*. Swellendam, *Wallich*, *Drège*. Riversdale Div.; Paardeberg, *Muir* 5338! George Div.; Cradock Berg, near George, *Burchell*, 5979! *Mund* (*Ecklon & Zeyher* as *Thesium*, 52 partly)! Knysna Div.; Outeniqua Mountains, *Krauss*! near Goukamma Rivers, *Burchell*, 5588! Humansdorp Div.; Fynbosch Hoek, *Kotze*, *For. Dept. Herb.* 3007! 3008! Witte Els Bosch, 900-1000 ft., *Fourcade*, 2293! Kromme River, *Drège*! Storms River, *Hutchins*! Uitenhage Div.; Van Staadensberg Range, *Burchell*, 4688! Albany Div.; Grahamstown, *Thom* (?) 108! King Williamstown Div.; Mountains, according to *Sim*.

W. natalensis, Endl. Syn. Con. 34, which was very imperfectly described from a specimen said to have been sent by Gueinzius and Krauss from "Port Natal," is very likely *W. cupressoides*. Neither collected in the Drakensberg Mts., which were then (1839–1843) botanically quite unknown. On the other hand, both visited the area of *W. cupressoides* before they went to Natal.

Although the originals of Linnaeus' *Cupressus juniperoides* –two seedling plants –are lost, it is practically certain that they belonged to the same species as his *Thuja cupressoides*, described by him four years later. The same applies to Miller's *Cupressus africana* and Lamarck's *Juniperus capensis* and the various new combinations which rest on them. This has already been suggested by Schlechtendal, l.c., and, apart from other considerations, it is evident since the Cedarberg Mountains, the home of *Widdringtonia juniperoides*, Endl., were not known before the beginning of the 19th century, and certainly were not explored botanically until 1829. *W. cupressoides* is the Cape Cypress, Berg Cypress, or Sapree-hout of the Cape Colonists.

W. Commersonii, Endl. Syn. Conif. 34 (Syn. *Thuia quadrangularis*, Vent. in Nouv. Duham. iii. 16; *Pachylepis Commersonii*, Brogn. in Ann. Sc. Nat. 1re sér. xxx. 190), described from a specimen cultivated at Reduit in Mauritius about 1800 is possibly, as already suggested by Carrière, *W. cupressoides*.

4. W. dracomontana (Stapf ex Dallimore & Jackson Handb. Conif. 540); a shrub, 8–10 ft. high, rarely a tree; ultimate ramifications slender, about $\frac{1}{2}$ lin. in diam.; leaves of the juvenile state unknown, of the adult state decussate, squamiform, those of the older branches with an ovate subacute appressed blade, the free portion not much over 1 lin. long, those of the ultimate divisions tightly appressed with the upper part more or less bulging, so that the contour of the twigs is a broken line, oblong to obovoid-oblong, hardly ever rhombic, subacute to subobtuse, with the free and adnate portions about equally long, obtusely keeled if at all, oblong, about 1 lin. long, ebracteate and subsessile in the cup formed by the subtending foliage leaves; scales in about 6 pairs, subpeltate, rhombic-ovate, obscurely acuminate, subcoriaceous, slightly keeled upwards; pollen-sacs 4, almost covered by the scales in the cone; female strobiles in short, very scanty spikes, terminating with a vegetative bud; cones at the time of pollination up to 2 lin. in diam., exceeding the subtending squamiform ovate subacute bract; scales ovate-oblong, subobtuse, stout, particularly along the median line, but without a well-marked hump on the face, olive-green, more or less bluish-pruinose on the face when dry; ovules 3 with each scale, bottle-shaped, with 2 obscure equal wings; cones 1–2 from each spike, globose to ovoid-globose, smooth with a short stout point (morphological apex) from below the top, purplish-brown with a glaucous bloom, when quite mature 9–10 lin. in diam., blackish-grey; valves wrinkled, but not or only very scantily tubercled, furrowed on the face, seed-scars obscure; seeds up to 12 (?), somewhat compressed, oblong to lanceolate- or ovate-oblong, about $3\frac{1}{2}$ by $1\frac{1}{2}$ lin., equally or subequally winged on the sides, the wings meeting at the apex in a notch, about 1 lin. wide, dark brown or the nucleus black. *W. cupressoides*, Sim, Tree Plant. Natal, 234; For. Fl. Cape Col. 337

(the Drakensberg plant); Bews in Ann. Natal Mus. iii. 549; not of Endl. *Callitris cupressoides*, Wood, Handb. Fl. Natal, 122, and in Trans. S. Afr. Phil. Soc. xviii. 122, 224, not of Schrad. *C. natalensis*, Endl. ex Fourcade, Rep. Natal For. 1889, 161, 121.

EASTERN REGION: Griqualand East; Mt. Ayliff Distr., *Pole-Evans*, 30004! Transkei: Baziya Mountains, *Herb. For. Dept.*, 1375!

NATAL: Drakensberg Range, headwaters of the Bushman's River (Langalibalele's location), *Fannin*! *Sanderson*, 2011! Giant's Castle Game Reserve, *For. Dept. Herb.* 2960! 2989!; between Cathkin Peak and Mont aux Sources, forming isolated woods or clumps at high altitudes, according to Fourcade; without precise locality, *Sim* in *Herb. For. Dept.*, 1044!

A coloured drawing communicated by J. Sanderson, along with a fruiting specimen, shows this species as a pyramidal tree of very regular habit with drooping branches and twigs. Sim and Bew say it is rather a shrub than a tree, but Sim also states that it has grown into a tree in the Pietermaritzburg Garden.

5. W. Schwarzii (Mast. in Journ. Linn. Soc. xxxvii. 269); a tree, 50–80 ft. high, with a straight bole and pyramidal habit; branches ascending, ultimate ramifications of the adult plant almost cylindric, $\frac{1}{2}$ lin. in diam.; leaves of juvenile state unknown, of adult state decussate, squamiform, those of the older branches with a broad-ovate, acute or subacute appressed free blade, the free portion $\frac{3}{4}$–1 lin. long; those of the ultimate divisions squamiform, usually tightly appressed so that the contour is often a perfectly straight line, or more or less wavy towards the tips of the twigs, rhombic-oblong, $\frac{3}{4}$–1 lin. long, subacute at both ends, the free portion much shorter than the adnate, rounded on the back or very obscurely keeled; male strobiles oblong, 1 lin. long; scales in about 6 pairs, subpeltate, ovate, acute, much convex on the back, coriaceous, $\frac{1}{2}$ lin. long; pollen-sacs 4, covered by scales in the strobile; female strobiles unknown in the pollination state; cones solitary (always?) on short clustered branches, $1\frac{1}{2}$–$1\frac{3}{4}$ in. long, subglobose, not quite 1 in. in diam., grey or brownish-grey, valves more or less spreading, upright, coarsely wrinkled and tubercled on the concave back, the tubercles mostly along the edges, and with a short blunt spur (the morphological apex) below the top, 10–11 lin. by 6-7 lin.; seeds 10–14; body of the seed more or less obliquely ovoid to ovoid-lanceolate, slightly compressed, 3–4 lin. long, 2-winged upwards, including the wings 4-6 lin. by 2 $3\frac{1}{2}$ lin. broad-elliptic to obovoid, emarginate, black to brownish-black with a silky lustre, wings usually paler. Sim, For. Fl. Cape Col. 337, and Native Timb. S. Afr. 131 (in part); Marloth, Fl. S. Afr. i. 101, t. 17 D.; Dallimore & Jackson, Handb. Conif. 541. *Callitris Schwarzii*, Marloth, in Engl. Jahrb. xxxvi. 206, with figs. A–E; Marloth, Kapland, 134.

CAPE PROVINCE: Willowmore Div.; Kouga Mountains and Bavians Kloof Mountains, near Nieuwe and Bosch Kloof farms, 2600–3900 ft., *Schwarz*! *Herb. Marloth*, 3614! *Herb. For. Dept.* 1107! 1108! *Herb. Sim*, 2920! *Civil Commissioner, Willowmore*, 1412, 1912!

6. W. juniperoides (Endl. Syn. Conif. 32, excluding the synonymy); a tree, mostly 15–20 or occasionally up to over 60 ft. high, trunk up to 3 or 4 ft. in diam., branches horizontally spreading; ultimate ramifications of the adult plant almost cylindric, $\frac{1}{2}$–$\frac{5}{8}$ lin. in diam.; leaves of juvenile state unknown, of adult state decussate, squamiform; those of the older branches with an ovate acutely acuminte upwards free and somewhat spreading or appressed free blade, the free portion rarely much over 1 lin. long; those of the ultimate divisions tightly appressed, with the upper part more or less wavy, or slightly spreading so that the contour of the twigs is rarely a straight and unbroken line, rhombic-ovate to rhombic-oblong, about 1 lin. long, subacute at both ends or more obtuse at the lower, the free portion shorter than the adnate, slightly keeled on the back or rounded; male strobiles cylindric-oblong, $1\frac{1}{2}$-2 lin. long, ebracteate and subsessile in the cup formed by the subtending foliage leaves; scales in about 6 decussate pairs, coriaceous, subpeltate, very broadly ovate, minutely apiculate to subobtuse; pollen-sacs 4, covered by the scales in the strobile; female strobiles in short densely scattered or crowded spikes, $\frac{1}{4}$–$\frac{1}{3}$ in. long and terminating with a vegetative bud; strobiles at the time of pollination up to over 1 lin. across, exceeding the subtending squamiform broad-ovate acute bract; scales ovate, subacute or obscurely apiculate, stout with a large hump on the face, olive-green; ovules about 3 with each scale, bottle-shaped, broad, compressed, slightly unilaterally winged. Cones 1–3 in a spike, close, and if the spikes are crowded forming occasionally large compact clusters, globose, $\frac{1}{2}$–$\frac{3}{4}$ in. in diam., dark purplish-brown and usually covered with irregular roundish bosses from among which on each scale rises a stout conical pointed tubercle; valves ultimately slightly spreading, coarsely warty or tubercled along the margins, with a stout conical often pungent mucro (the morphological apex) from below the top, and a usually striated central area; seeds 4–8, stout more or less triquetrous-ovoid, 4 lin. long with a very narrow wing along 2 of the angles and over the tip, almost jet-black and somewhat glossy when mature or paler towards the base with a large white scar corresponding to similar scars at the base of the valves. Lindl. & Gord. in Journ. Hort. Soc. v. 203; Knight, Syn. Conif. 13; Pappe, Silva Cap. 30; Fl. Cap. Med. Prodr. ed. ii. 36; Carr. Trait. Conif. ed. i. 64; ed. ii. 58; Gordon, Pinet. ed. i. 334; suppl. 107; ed. ii. 418; Schlechtend. in Linnaea, xxxiii. 356, 361, tab. i. fig. 2; Henk. & Hochst. Syn. Nadelhölz. 292; Parlat. in DC. Prodr. xvi. ii. 442; Rehmann, Geo-bot. Verh. S. Afr. (in Bot. Centralbl. i. 1120, 1122); Masters in Journ. Linn. Soc. xxxiii. 268; Sim, Tree Plant. Natal, 234; For. Fl. Cape Col. 336, tab. 147 and Native Timb. S. Afr. 131, t. 27; Marloth, Fl. S. Afr. 101, 104, tab. 17 B, and 19; Dallimore & Jackson, Handb. Conif. 540; Wilson, Plant Hunt. t. 6. *W. Wallichii*, Endl. l.c. 34 (name); Lindl. & Gord. l.c.; Carr. Trait. Conif. ed. i. 68; ed. ii. 62; Gordon, Pinet. ed. i. 335; ed. ii. 419; Schlechtend. l.c. 359; Henkel & Hochst. l.c. 295; Parlat. l.c. 433; Masters, l.c. 271, 273, 274.

W. Wallichiana, Gord. Pinet. suppl. 107 (name). *Callitris arborea*, Schrad. ex Drège, Zwei Pflanzengeogr. Doc. 73 (name) ; Hutchins in Report Conserv. For. Cape Col. 1895, 48, 49 ; in Trans. S. Afr. Phil. Soc. xi. 62 ; in Agric. Journ. Cape Good Hope, xxvi. 661, 662 ; Storr Lister, Rep. Chief Conserv. Fort. Cape Good Hope, figs. on p. 2. *C. stricta*, Schlecht. (err. pro *C. arborea*, Schrad.) Hook. f. in Lond. Journ. Bot. iv. 141. *C. Ecklonii*, Schrad. ex Pappe, Fl. Cap. Med. Prodr. ed. i. 25. *C. juniperoides*, Durand & Schinz, Consp. Fl. Afr. v. 951 ; Engler, Pflanzenw. Afr. ii. 88 ; Marloth, Kapland, 167, fig. on p. 168. *Parolinia juniperoides*, Endl. ex Gord. Pinetum, Suppl. 107. *Pachylepis* sp., Hook. f. l.c. 142.

Cape Province : Clanwilliam Div. ; Cedarberg Mountains, scattered singly or in small clumps over a range of 30 miles mainly between 3000 and 6500 ft., *Zeyher* ; *Drège* ! *Wallich* ! *Leipoldt in MacOwan, Herb. Aust. Afr.* 1649 ! *Budler in Herb. MacOwan*, 3034 ! *Herb. For. Dept.* 1027 ! 1029 ! 1030 ! *Herb. Sims* ! *Hutchins* !

Masters' statement that it also occurs at Swellendam is due to an old erroneous entry in the Kew Herbarium according to which Wallich collected it in that locality. His specimens are in fact from the Cedarberg Mts., as is shown by a note in his own handwriting in the collections of the British Museum. Leipoldt's specimens have unusually smooth, small and barely mature cones with small marginal tubercles and more conspicuously, yet still narrowly, winged seeds. The cones were collected in June when the tree was in flower, and their peculiar condition may be due to delayed development. They were found in an unusually low locality (2500 ft.) and are also interesting on account of the presence of male strobiles on the female branches. The tree was certainly not known in Linnæus' time, and probably not until Zeyher and Drège collected it in 1829 and 1830 respectively. Linnæus' *Cupressus juniperifolia* and all the other names connected with it have therefore to be struck out of the synonymy of this species. A valuable timber tree (see particularly Sim and Hutchins, ll.cc.). The Cedar-boom or Cape Cedar of the Cape Colonists.

W. equisetiformis, Mast. in Journ. Linn. Soc. Bot. xxxvii. 271, described from specimens cultivated in the Tokai plantations near Cape Town (!) and others (*Baur*, 1164 !) communicated to the author from the Katbergen, Stockenstrom Division, has since been identified by the author himself as *Callitris robusta*, a native of Australia (see *Journ. Linn. Soc. Bot.* xxvii. 332).

Order CXXVIII. **CYCADACEÆ.**

(By J. Hutchinson & G. Rattray.)

Male and female scales (sporophylls) arranged spirally or superimposed in cones (except in *Cycas*) ; cones dicœcious. ***Male cones*** solitary to several, terminal or subterminal, composed of numerous, usually thick and fleshy or subwoody, often peltate scales bearing on their lower surface very numerous and crowded 1-locular sporangia, the latter often collected in small groups. ***Female cones*** terminal or subterminal ; scales usually numerous, more or less

peltate, bearing 2 orthotropous inverted ovules on the lower side (or in *Cycas* several and erect in the sinuses of the segments of the leaf-like sporophyll). *Seeds* large, drupe-like, globose, ovoid or oblong, turgid or angular, the outermost layer of the integument fleshy and often coloured, middle layer crustaceous or bony; endosperm abundant, fleshy, with one or more embryonic cavities, but with usually a solitary, slender, cylindric embryo; cotyledons 2; radicle superior, attached by the spirally twisted suspensor.

Stem subterranean or above ground and attaining small tree-form, simple or sparingly branched, with a terminal tuft of leaves. Leaves spirally arranged, the spirals alternating with rows of short coriaceous prophyllary scales; blade divided usually to the midrib into separate leaflets, the latter with or without a midrib, longitudinally nerved or rarely (*Stangeria*) pinnately nerved and the lateral nerves forked.

Species about 80, in the tropics, subtropics, and temperate regions, mainly of the Southern Hemisphere.

We are much indebted to the Director of the Botanical Survey of South Africa for the loan of specimens from the Pretoria and Durban herbaria, and for photographs of plants in their native habitats in the Transvaal; also to the Directors of the Cape Town and Albany Museums.

An interesting collection of living South African Cycads has been brought together by Colonel Molyneux, in the Old Fort garden in Durban, which the junior author had the pleasure of visiting in August, 1930. Many plants are also grown around the Union Buildings at Pretoria, at the National Botanic Gardens, Kirstenbosch, near Cape Town, and in the Municipal Gardens, Cape Town. The majority of the species are also in cultivation in the Palm House at Kew.

I. **Stangeria**.—Leaflets with a prominent midrib and spreading forked lateral nerves, the upper leaflets connate at the base and decurrent on the rhachis; aerial stem absent.

II. **Encephalartos**.—Leaflets without a distinct midrib, the nerves parallel with the margins; leaflets never connate at the base; aerial stems present or absent.

I. STANGERIA, T. Moore.

Cones dicœcious. *Male cones* cylindric, slender; scales densely imbricate in many series, spirally arranged; pollen-cells stipitate; pollen ellipsoid. *Female cones* ovoid-ellipsoid, shorter than the male, shortly pedunculate, densely tomentose; scales deltoid at the top with the lower side rounded, bearing at the base a pair of inverted ovules. *Seeds* broadly ellipsoid, with a dark red fleshy outer coat.

Stem subterranean, simple or branched, nude; leaves few, long-petiolate, pinnate; leaflets several pairs, opposite or subopposite, sometimes the upper ones connate at the base, entire, toothed or incised-lobate, with a conspicuous midrib and numerous spreading forked lateral nerves.

DISTRIB. Species 1, South-east Africa; coastal region from Bathurst to Zululand.

Stangeria eriopus (Nash in Journ. New York Bot. Gard. x. 164, pl. lxii (1909); stem subterranean, branched or unbranched, branches short and thick, cylindrical to obovoid, the woolly scales persistent only at the apex; leaves 1–3 to each crown; petiole as long as or longer than the blade, deeply grooved on the upper side, glabrous; leaflets 5–14 pairs, opposite or subopposite, the lowermost stalked, the upper connate and decurrent on the rhachis on the lower side, entire or serrulate to irregularly incised-lobate, elongate-lanceolate, acutely acuminate to rounded at the apex, up to 12 in. long and 2 in. broad, with numerous very closely parallel forked pinnate lateral nerves, glabrous; male cones solitary, brownish, pedunculate, cylindric, gradually tapered to the apex, 6–15 in. long, up to 3 in. in diam., with numerous spirals of closely imbricate scales; scales at first woolly, soon glabrescent, broadly triangular or rhomboid, jagged-toothed; female cones solitary, shortly pedunculate, densely tomentose, ovoid-ellipsoid, up to 7 in. long and $3\frac{1}{2}$ in. in diam.; scales deltoid, with the lower side rounded; seeds broadly ellipsoid, dark red, about 1 in. long; aril very fleshy. *Lomaria coriacea*, Kunze in Linnæa xiii. 152 (1839), not of Schrad. *L. eriopus*, Kunze, l.c. xiii. 152 (1839), and xviii. 116 (1844). *Stangeria paradoxa*, T. Moore, in Hook. Journ. Bot. v. 228 (1853); Hook. Bot. Mag. t. 5121; Miq. Prodr. Cycad. 9, 18; DC. Prodr. xvi. ii. 530; Chamberlain in Bot. Gaz. lxi. 353, with figs. (1916); Pearson in Trans. S. Afr. Phil. Soc. xvi. 349, pl. viii; Schuster in Engl. Pflanzenr. Cycadac. 105, fig. 15, A–K, and t. 3 (1932). *S. schizodon*, Bull. Cat. 1872, 8. *S. paradoxa* var. *Katzeri*, Marloth Fl. S. Afr. i. 97, fig. 63, and pl. 14 (1913); Schuster, l.c. 105. *S. paradoxa* forma *schizodon*, Schuster, l.c. 105. *S. Sanderiana*, Hort. *S. Katzeri*, Regel Gartenfl. xxiii. 163, t. 798 (1874). *S. Zeyheri*, Stoneman, Plants and Their Ways in S. Afr. fig. 214 (1915). See observations by Seemann, Bot. H. M. Herald, 235 (1852–7).

GEOGRAPHICAL RANGE:—Narrow coastal strip from the Kowie River, Bathurst Div., through the native states and Natal to South Zululand; on grassy slopes, the edge of bush, or in the forest; variable according to habitat.

Bathurst Div.: between Riet River and Great Fish River, *Macowan*, 2000! Kentani Div.: coast belt between sand dunes, *Pegler*, 262! near Zolora River mouth, *Pegler*, 262! Manubi Forest, *Pegler*, 1247! Port St. Johns, *Rattray*! *Schonland*, 3957! Egossa Forest, *Sim*! Pondoland: Umteentu River, in shade of trees amongst rocks, *Burtt Davy*, 15315! Lusikisiki, *Doran* in Herb. S. Afr. Mus., 9412! without locality, *Bachmann*, 66! Natal: Manda, *Buchanan*, 36! Nahoon River, *J. M. Wood* in Herb, S. Afr. Mus. 1350! Dumisa, Alexandra distr., wooded slopes by the Umtwalumi River, *Rudatis*, 669! Pinetown, *Rehmann*, 7959!

Fig. 3.—STANGERIA ERIOPUS Nash—(1) Typical leaf from open veld; (2) leaflet from forest locality; (3) portion of leaflet showing veins; (4) margin of serrulate leaflet; much reduced, except (3) and (4).

II. ENCEPHALARTOS, Lehm.

Cones dicœcious. *Male cones* pedunculate; scales densely imbricate in many series, spirally arranged, often narrowed at the apex; pollen-cells very numerous on the lower side. *Female cones* sessile or shortly pedunculate, similar to the male but often larger and thicker, sometimes completely enveloped by woolly hairs; scales more or less truncate at the top and often coarsely wrinkled, bearing 2 collateral inverted ovules towards the base. *Seeds* with a yellow or red fleshy outer coat.

Stems underground or rising to small trees, simple or slightly branched, covered with scales and the scars of fallen leaves; leaves spirally arranged near the top of the stem, pinnate; leaflets linear to lanceolate or acicular, entire or toothed, often pungent-pointed, without a midrib; nerves longitudinally parallel; lower leaflets sometimes gradually reduced to prickles.

Species about 20, confined to the South-eastern regions of South Africa, and in Tropical Africa.

Stemless or nearly so:

Leaflets entire (rarely a few teeth only near the apex), very crowded, the lower ones reduced in size but not like prickles, never glaucous ... ... (1) **caffer.**

Leaflets toothed or lobate-spinose (rarely a few leaflets on each leaf entire):

Leaflets with a definite terminal pungent apex or lobe distinct from the lateral teeth, linear and toothed or broader and coarsely dentate-lobate:

Lower leaflets gradually reduced to numerous prickles, the remainder often 2–3-dentate at the apex, broadly linear, with small lateral teeth; leaflets spreading in one plane from the rhachis, not glaucous; rhachis woolly when young (see fig. 4) ... ... (2) **villosus.**

Lower leaflets not reduced to prickles, nearly all coarsely lobate-spinose-dentate, the lobes diverging at various angles from the general plane of the leaflet, markedly glaucous ... ... (3) **horridus.**

Leaflets divided at the apex into 3–5 short very broadly triangular lobes, without a definitely longer terminal lobe, oblong-elliptic, with numerous parallel nerves (see fig. 5) ... ... (4) **kosiensis.**

Stems well developed, several feet high, branched or unbranched:

* Leaflets toothed or lobate-toothed (or if entire then very glaucous or broadly linear), linear-oblong to ovate-lanceolate; cones not very woolly; seeds red:

Leaflets glaucous, linear and tapered to the apex, coarsely lobate-dentate or rarely entire, markedly spinose-pointed (see fig. 6) ... (5) **Lehmannii.**

Leaflets green :

Leaflets coarsely lobate-dentate on the lower margin, usually rather short in proportion to their width, very strongly nerved with numerous nerves (see fig. 7) ... ... (6) **latifrons.**

Leaflets shortly toothed or the lower ones at most coarsely toothed :

Mature leaflets glabrous below, with inconspicuous nerves :

Leaflets entire or toothed mainly on one side, obliquely linear-lanceolate, one side curved, the other nearly straight, the lower leaflets not reduced to prickles ... ... (7) **longifolius.**

Leaflets equally toothed on both sides, broadly linear, with parallel margins, the lower not reduced to prickles ... (8) **Altensteinii.**

Leaflets more or less ovate-lanceolate, the lower ones gradually reduced to prickles (see fig. 8) ... ... (9) **Woodii.**

Mature leaflets pubescent below, with very strongly marked numerous nerves, the lower leaflets rather abruptly reduced to prickles ... ... (10) **paucidentatus.**

** Leaflets entire, fern-like, never glaucous, narrowly linear or acicular, crowded and numerous; rhachis usually very woolly, especially when young; cones very woolly-tomentose; seeds yellow or dull brown :

Leaflets linear, flat, with a strong cartilaginous but not recurved margin :

Nerves of the middle leaflets 7-9 between the margins, very strong and rounded and completely filling the lower surface of the leaflets ... ... (11) **cycadifolius.**

Nerves of the middle leaflets 12 14 between the margins, slender and somewhat obscure, not filling the lower surface ... ... (12) **lanatus.**

Leaflets subacicular, with much recurved margins; nerves 3–4, very obscure on the lower side ... (13) **Ghellinckii.**

1. **E. caffer** (Lehm. Pugill. vi. 14 (1834)); stem subterranean, about 1 ft. in diam., woolly; leaves green, up to about 14 in a crown, up to 2 ft. long; petiole $\frac{1}{4}$–$\frac{1}{3}$ as long as the rhachis, at first woolly towards the base, soon nearly glabrous; rhachis bluntly 4-ribbed, woolly when young; leaflets very numerous and crowded, longest about the middle of the leaf, the lowermost becoming much reduced,

all narrowly linear-lanceolate, contracted above and decurrent at the base, sharply spinulose-acute, entire or with 1-2 teeth near the apex, middle leaflets 2–4 in. long, about $\frac{1}{3}$ in. broad, pubescent when young, about 10-nerved, with strong marginal nerves; male cones solitary or 2–3 together, pedunculate, oblong-lanceolate, 8–12 in. long, 2–3 in. in diam.; scales rhomboid and concave at the top, rugose; female cones pedunculate, oblong or ellipsoid, about 6 in. long and 4 in. in diam.; scales in 4–6 spirals, broadly transversely subrhomboid-elliptic, concave, green, with orange margins, nearly glabrous, about $1\frac{1}{2}$ in. broad; seeds broadly oblong, red, about $1\frac{1}{4}$ in. long. Miq. Monogr. Cycad. 53, partly (1842); Prodr. Cycad. 20, partly (1861); DC. Prodr. xvi. ii. 532. *Cycas caffra*, Thunb. in Nov. Act. Soc. Scient. Upsal. ii. 285, t. 5 (1775), as to figure and part of description. *Zamia caffra*, Thunb. Prodr. Fl. Cap. ii. 92 (1800); Fl. Cap. ed. Schult. 429, partly (1823). *Zamia Cycadis*, Linn. f. Suppl. 443 (1781). *Encephalartos brachyphyllus*, Lehm. Cat. Hort. Hamb. 1836, ex Lehm. & De Vriese Tijdschr. Nat. Gesch. iv. 414, t. vi. and vii. (1838). *E. caffer* var. *brachyphyllus*, A.DC. in DC. Prodr. xvi. 2, 532 (1868).

GEOGRAPHICAL RANGE: Uitenhage, Bathurst, East London, southern part of King Williamstown and northwards to Zululand.

Uitenhage Div.: *Tredgold*, no. 2 (Herb. Brit. Mus.)! Van Staadens, *Rattray*, 1098! between Hoffmannskloof and Driefontein, 1000–2000 ft., *Drège*, 8254! East London Div.: rocky hill near Mt. Coke, in open ground, *Galpin*, 7839! Kentani Div.: outside forest, rare, Sept., *Pegler*, 1124! Feb., *Pegler*, 2156! Zululand: near Ngoye, *Rattray*, 1278! without locality, *Oldenburg*, 1497!

CULTIVATED SPECIMENS: Municipal Gardens, Cape Town, *Herb. S. Afr. Mus.*, 24359! *Nat. Herb. Durban* (from Zululand), 16040! Bot. Gard. Grahamstown, *E. Tidmarsh*!

According to Wylie this species is common in some parts of Zululand, where it grows almost socially; the seeds are much sought after by baboons, who carry them to the tops of the krantzes and thus facilitate distribution.

In his original description Thunberg confused two species, the dwarf stemless plant which he figured and which is described above as the true *E. caffer*, and another with a well-developed stem, *E. longifolius* Lehm.

2. E. villosus (Lem. Illustr. Hort. xiv. Miscell. 79 (1867)); stem subterranean, very densely woolly-villous; leaves shining green, usually few in a crown, slightly arcuate, up to 9 ft. or more long; petiole, rhachis and leaflets densely woolly-villous when young, becoming glabrous or nearly so; leaflets numerous, the lower ones gradually and markedly reduced to prickles, the middle and upper ones broadly linear, pungent-pointed, usually with a few small ascending teeth and often 2–3-dentate at the apex, up to 8 in. long and $\frac{3}{4}$ in. broad, the broadest about 25-nerved, nerves slightly prominent below; male cones yellowish, conspicuously pedunculate, slender, cylindric, slightly tapering to the top, about 2 ft. long

Fig. 4.—ENCEPHALARTOS VILLOSUS Lem. –(1) Basal portion of leaf showing reduction of leaflets to prickles, typical of this species; (2) upper portion of leaf; (3) single leaflet from about the middle; (4) portion of leaflet showing characteristic 3-pronged top; (1), (2) and (3) much reduced.

and 3–4 in. in diam. ; scales markedly peltate, irregularly rhomboid at the top, about 1 in. across, glabrous, rugose when dry with undulate margins ; female cones pedunculate, more ellipsoid or subovoid, shorter and about twice as thick as the male, brilliant yellow when ripe ; scales overlapping downwards, rhomboid at the top, the lower margin more or less irregularly toothed ; seeds red, about $1\frac{1}{4}$ in. long, nearly as broad as long, oblong-ellipsoid. Lem. l.c. xv. t. 557 (1868) ; Bot. Mag. t. 6654 (1882) ; De Wild. Ic. Select. Hort. Thenen. iv. 173, pl. clx (1903) ; Marloth Fl. S. Afr. i. 96, t.15, fi g. B; t. 16, fig. B. *E. striatus*, Stapf & Burtt Davy in Fl. Transv. i. 99, fig. 4, C. *Zamia villosa*, Gaertn. Fruct. i. t. 3 (1788) ; Willd. in Mag. Ges. Naturf. Freunde Berlin x. t. 6 (1810) ; *Zamia cycadifolia*, Jacq. Fragm. 27, partly, as to t. 25, female cone only (1800).

GEOGRAPHICAL RANGE : From the Keiskama River north-eastwards to Natal and Delagoa Bay, within about 40 miles of the coast, growing in shade. The late Mr. W. Watson noted that he saw hundreds of this species growing in dense woods along the Buffalo River near East London.

East London Div. : wooded kloofs, East London, *J. M. Wood in Herb. Galpin*, 3340 ! near East London, *Smale*, 23 ! *Rattray*, 386 ! Nead's Camp, 4000 ft., *Galpin*, 3340 ! in dense shade of forest at Gonubi River mouth, *Galpin*, 7767 ! Kentani Div. : in forests, male and female in May, *Pegler*, 342 ! in woods near the Kei River mouth, *Flanagan in S. Afr. Mus. Herb.*, 1374 ! Delagoa Bay : " from Delagoa Bay," growing in Union Buildings Gardens, Pretoria (coll. *Wickins*) ! Living specimens at Kew !

We have seen seedlings collected by *Miss Pegler* (no. 342) :—Seedling leaflets about 8 pairs, oblong-oblanceolate, about 2 in. long and $\frac{1}{3}$ in. broad, toothed mainly in the upper half ; aerial roots well developed and much branched ; crown of seedling softly villous.

3. E. horridus (Lehm. Pugill. vi. 14 (1834)) ; stem subterranean or very short, covered with rough leaf-bases, slightly villous ; leaves glaucous, numerous in a crown, markedly recurved at the top, very prickly, up to about 2 ft. long ; petiole and rhachis glabrous ; leaflets spaced, thick and rigid, obliquely ovate-lanceolate, spinous-lobate mainly on the lower margin, lobes in different planes, very pungent-pointed, the middle leaflets the longest and about 4 in. long and 2 in. broad (including the lobes), obscurely nerved, contracted and shortly decurrent at the base ; male cones pedunculate, about 1 ft. long and $2\frac{1}{2}$ in. in diam., cylin ric, slightly tapered at both ends ; scales somewhat irregularly rhomboid, about $1\frac{1}{2}$ in. across and $\frac{3}{4}$ in. high, very slightly pubescent ; female cones shortly pedunculate, broadly oblong-ellipsoid, more or less triangular at the top, about 1 ft. 3 in. long and $6\frac{1}{2}$–8 in. in diam. ; scales in 8–10 spirals, more or less hexagonal, about 2 in. broad, with an irregularly rhomboid flattish or depressed top and very rugose surface ; seeds oblong, orange-red, slightly angular, about $1\frac{1}{2}$ in. long. Miq. in Ann. Sci. Nat. Ser. II. x. 366 (1838) ; in Tijdschr. Nat. Gesch. vi. 94, tt. 3 and 4 (1839) ; Monog. Cycad. 58 (1842), and in

Fig. 5.—ENCEPHALARTOS KOSIENSIS Hutch.—(1) Upper half of leaf; (2) top of leaflet; reduced.

Linnæa, xvii. 726; DC Prodr. xvi. ii. 532, partly and excl. var.; Worsdell in Trans. Linn. Soc. Bot. Ser. II, v. 449, 452 (1900); Schuster in Engl. Pflanzenr. Cycadac. 116, with figs., excl. vars. *Van Hallii* and *latifrons* Schuster. *Zamia horrida*, Jacq. Frag. 27, tt. 27 and 28 (1800). *Encephalartos nanus*, Lehm. Tijdschr. IV, 421, t. 8, fig. C. (1837–8). *E. horridus* var. *nanus*, Schuster l.c.

GEOGRAPHICAL RANGE: Addo Bush, in the Uitenhage Div.

Uitenhage Div.: around Despatch, *Rattray* (S. Afr. Mus. Herb. 845! 1906!).

Cultivated at Pretoria, *Nat. Herb.*, no. 8037! Living specimens at Kew!

As this species is liable to be confused with *E. latifrons* Lehm., we give the following table of differences:—

E. horridus.	**E. latifrons.**
No aerial stem.	**Stem 8–10 ft. high.**
Leaves glaucous.	**Leaves not glaucous.**
Leaflets rather narrow.	**Leaflets distinctly broad.**
Male and female cones small, about 1 ft. long.	**Female cone large, about 2 ft. long, up to 60 lbs. weight, the upper part not fertile.**
Habitat: Thorny scrub.	**Habitat: Open grass veld.**

4. E. kosiensis (Hutch. in Kew Bull. 1932, 512); stemless or nearly so (stems at most a few inches high –*fide Aitken and Gale*); leaves probably about 3 ft. long; rhachis narrowly grooved on the upper side, glabrous; leaflets probably about 20 pairs, crowded and slightly overlapping, oblong-elliptic, sessile with a very broad base, more or less rounded on each side at the base, without a definite apex but divided into 3–5 broadly triangular pungent-pointed lobes, with usually about 2–4 smaller lateral teeth on each margin, 3–6 in. long, 1½–2 in. broad, the largest with about 25 rather faint parallel nerves; cones not seen.

GEOGRAPHICAL RANGE: Coastal region of Zululand.

Zululand: behind sand-dune bush near Kosi Lake, East Ingwavuma district, *Aitken & Gale*, 63; Kosi Bay, *Col. Lugge in Natal Herb.*, 16507! Cultivated by *Col. G. Molyneux* at the "Old Fort," Durban, July 1930!

Further material and information about this species is much desired at Kew.

5. E. Lehmannii (Lehm. Pugill. vi. 14 (1834)); stem up to 9 ft. high; persistent leaf-bases broadly ovate, acuminate; leaves markedly glaucous, up to 3 ft. long; leaflets spaced on the rhachis, the middle ones the largest, entire or lobate-dentate, very pungent-pointed, linear or linear-lanceolate, the middle ones up to 8 in. long and ⅔ in. broad (excluding the teeth), very obscurely or not even visibly nerved, the teeth when present mostly on the lower margin

Fig. 6.—Encephalartos Lehmannii Lehm.—(1) Middle portion of leaf; (2) and (3) lobate leaflets; all reduced.

and near the middle or towards the top; male cones subsessile, slender, tapered towards the base, at length yellow, about 9 in. long and 2 in. in diam., cylindric; scales numerous, with a small suborbicular or quadrangular shortly strigillose-pubescent top; female cones sessile, short, broadly oblong-ellipsoid, about $1\frac{1}{2}$ ft. long and 1 ft. in diam.; scales at length ruddy brown, with a broadly ovate-acuminate limb and small truncate orbicular top; seeds red, about $2\frac{1}{4}$ in. long, including the aril. Otto and Dietr. Allgem. Gartenzeit. 1836, 217, t. 1; Miq. Monogr. Cycad. 47; Regel Gartenfl., 1865, 197, t. 477 (♂); DC. Prodr. xvi. ii. 531, incl. var. *spinulosus* Miq.; Schuster in Engl. Pflanzenr. Cycadac. 113, with figs. (1932). *Zamia Lehmanniana*, Eck. and Zeyh. ex Otto and Dietr. Allgem. Gartenzeit. 1833, no. 20, p. 158. name only. *Z. spinulosa*, Heynh. Nom. i 862 (1840). *Z. elongata*, Heynh. Nom. i. 862 (1840). *Z. occidentalis* Lodd. Cat. no. 177 ex Miq. in Linnæa xvii. 711 (1843). *Encephalartos spinulosus*, Lehm. in Tijdschr. Nat. Gesch. iv. 420, t. viii. fig. B (1838). *E. elongatus*, Lehm. l.c. 419, t. viii. A (1838). *E. mauritianus*, Miq. Monogr. Cycad. 48 (1842). *E. pungens*, Lehm. Pugill vi. 13; Miq. in Linnæa xix. t. 4 (1847). *E. Lehmannii* var. *spinulosus*, Miq. in Linnæa xix. 420 (1847); var. *dentatus* Regel. *E. horridus* var. *trispinosa*, Hook. Bot. Mag. t. 5371 (1863).

GEOGRAPHICAL RANGE: In dry semi-karoid places from Willowmore Div. to Grahamstown, and in Bedford, Queenstown, Komgha, and on the Tsoma River in the Nqamaqwe district (Native States).

Willowmore Div.: Groote River, *Gill*! Albany Div.: northern slopes of Bothasberg, near Grahamstown, *Galpin*, 3083! Penrock Farm, 10–12 miles from Grahamstown, in karoid scrub, 1500 ft., *Dyer*, 1184! Bathurst Div.: mouth of the Kowie River, 250 ft., *Macowan*, 1959! Somerset Div.: Bruntjes Hoogte (Bot. Gard. Cape Town)! Queenstown Div.: Junction Farm, *Rattray*, 1274! In valley of the Zwart Kei, about 5 miles above its junction with the White Kei, 2300–2600 ft., amongst dolerite rocks, *Galpin*, 8090! Queenstown, *Galpin*, 2708! Komgha Div.: exposed rocky slopes near Komgha, 2000 ft., *Flanagan*, 1373! Tsoma Div.: near Tsoma, *Sim*, 26!

CULTIVATED SPECIMENS: *Nat. Herb. Pretoria*, no. 8039! Living specimens at Kew!

Mr. Galpin and Dr. Rattray note that this species grows in fair numbers on steep hillsides amongst doleritic rocks along the Zwart Kei River about 5 miles above its junction with the White Kei, often by suckering and seedlings forming clusters of 8–10 plants together. Associated with it was *E. cycadifolius*.

6. E. latifrons (Lehm. in Tijdschr. Nat. Gesch. iv. 424, t. ix. fig. A, B (1837–38)); stem up to 8 ft. high and 4 ft. in circumference, rarely branched, upper part between the leaves more or less woolly; leaves dark green, up to 3 ft. long, markedly recurved towards the top; leaflets up to about 33 pairs, the middle ones the largest, overlapping, ovate or ovate-lanceolate, about 5 in. long and 2 in. broad, wide at the base, coarsely lobate-dentate on the lower margin, apex and lobes pungent-pointed, very prominently nerved, the nerves numerous, pubescent below, at length nearly

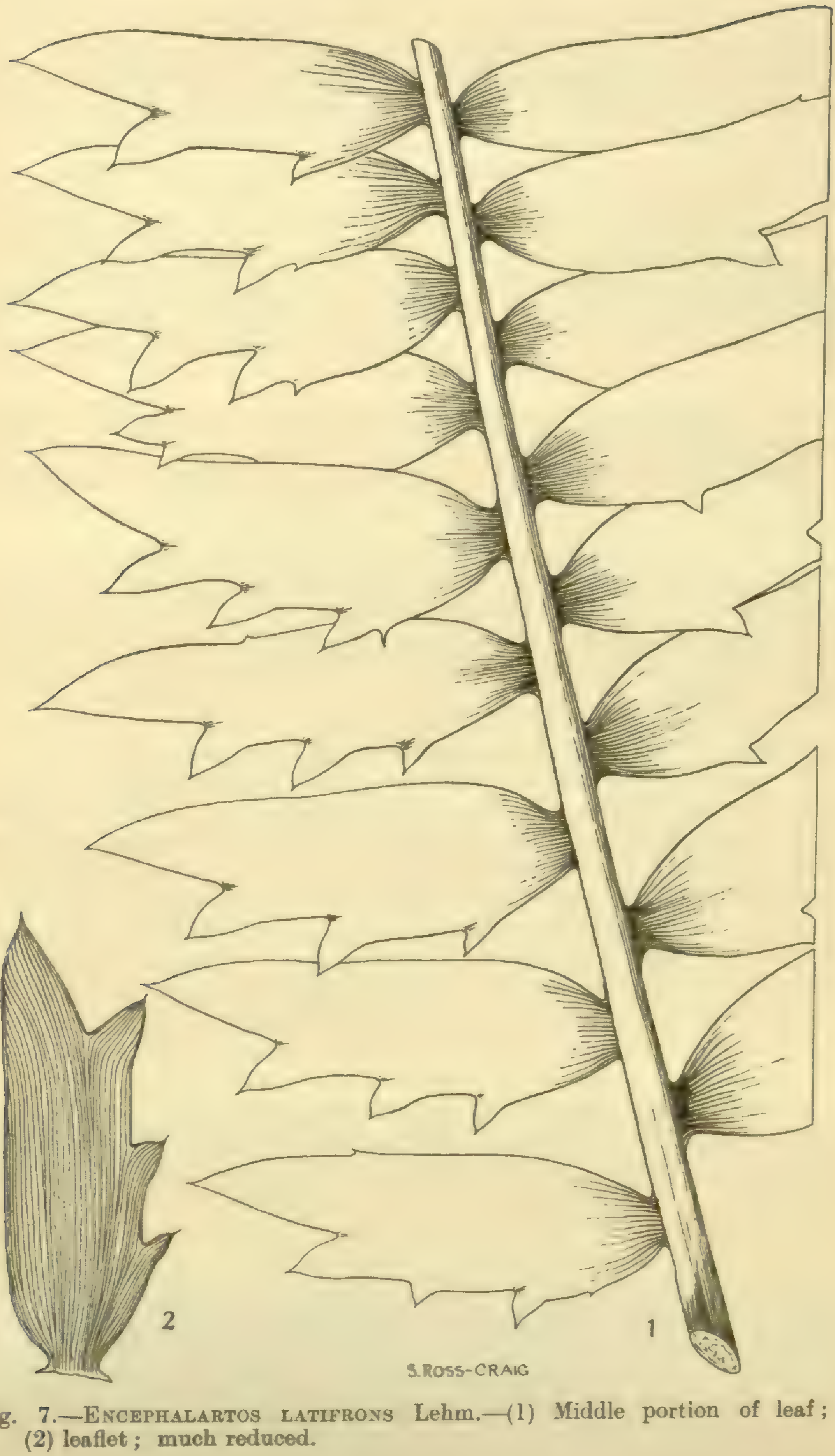

Fig. 7.—ENCEPHALARTOS LATIFRONS Lehm.—(1) Middle portion of leaf; (2) leaflet; much reduced.

glabrous; petiole with a marked yellow "collar" at the base; male cones 1–3 on a stem, with no visible peduncle, about 2 ft. long and 6 in. in diam., brownish yellow; scales much narrowed to and irregularly rhomboid at the top, not pubescent; female cones rare, up to 60 lbs. weight, sessile, broadly oblong-ellipsoid, up to 22 in. long and 10 in. in diam., with about 15 spirals of scales; scales very close, long-stipitate, umbonate and subrhomboid with a small concave, flat or beaked deeply rugose top; seeds about 2 2½ in. long, red. Lehm. in Tijdschr. Nat. Gesch. vi. 100, t. iii. (1839). *E. horridus* var. *latifrons*, Miq. in Ann. Sci. Nat. Ser. 3, x. 366, partly (1838); DC. Prodr. xvi. ii. 532; DC. Wild. Ic. Hort. Thenen. iv. 182. *E. Van Hallii*, Vriese in Tijdschr. Nat. Gesch. iv. 422, t. x. (1837-8). *E. horridus* vars. *Van Hallii* and *latifrons*, Schuster l.c. 117 (1932).

GEOGRAPHICAL RANGE: Uitenhage and Bathurst Divs., in open grass-veld and on low rocky ridges.

Uitenhage Div.: near Paarde Poort, *MacOwan*! Bathurst Div.: Trapps Valley, Clumber, 1000–1400 ft., about 10–14 miles from the sea, *Rattray*, 8439! (in S. Afr. Mus. Herb., 1100!). Living specimens at Kew!

According to Rattray the leaves persist for several years and occupy about 18 in. of the upper part of the stem; the female cones are ripe in January and the dried up male cones were then still present.

For comparison with *E. horridus* see note under that species.

7. E. longifolius (Lehm. Pugill. vi. 14 (1834)); stem well-developed, stout, about 12 ft. high or more, simple or rarely branched, the top dome-shaped between the bud and the mature leaves; leaves green, numerous in a crown, arcuate, recurved towards the tip; petiole fairly long, hairy when young; rhachis rounded below, with a prominent thick rib on the upper side, produced beyond the leaflets at the top; leaflets crowded, semi-erect (forming rather a wide V), lanceolate, obtuse to sharply acute at the apex, contracted and rather broad at the base, rather obscurely nerved, entire or with very few teeth usually on one side, the largest in the middle, up to 7 in. long and 1 in. broad, more rigid, thicker and darker green than in *E. Altensteinii*; male cones sessile or subsessile, oblong-lanceolate in outline, normally about 1½–2 ft. long and 6–8 in. in diam.; scales in very numerous spirals, lanceolate, acuminate with blunt hooked tops; female cones sessile, up to 90 lbs. in weight, 2 ft. long, 12–14 in. in diam.; scales in less numerous spirals than in the male, rhomboid, umbonate, very rugose; seeds red, broadly oblong, 1½–2 in. long and about 1 in. in diam. Miq. in Otto and Dietr. Allgem. Gartenzeit. 1838, 323; DC. Prodr. xvi. pt. ii. 531, incl. vars. *revolutus* Miq., *angustifolius* Miq., and *Hookeri* DC. l.c.; Schuster in Engl. Pflanzenr. Cycad. iii. figs. 3 A, 4 G, 6 A, 16 R U (1932). *Zamia longifolia*, Jacq. Fragm. 28, t. 29 (1809); Pers. Synop. ii. 631; Spreng. Veget. iii. 908. *Zamia lanuginosa*, Jacq. Fragm. t. 30 and 31 (1809). *Cycas caffra*, Thunb. in Nov. Act. Soc. Scient. Upsal. ii. 283, as to part of descr. only. *Encephalartos caffer*,

Hook. Bot. Mag. t. 4903, not of Lehm. (1859); Rev. Hort. 1869, 233, fig. 56. *E. lanuginosus*, Lehm. Pugill. vi. 14 (1834). *E. Altensteinii*, Gard. Chron. Ser. iii. xl. 206, fig. 84 (1906), not of Lehm.

GEOGRAPHICAL RANGE: From Assegai Bosch in Humansdorp Div. to Van Staadens Berg, Zuurberg, in open veld.

Humansdorp Div.: Assegai Bosch, *Thunberg*; without locality, Oldenburg 1497 (in Herb. Brit. Mus.)! Dried cultivated specimens from various collections! Living specimens at Kew!

Distinguishing features of this species, which was confused by Thunberg with the stemless *E. caffer*, and figured as such in the Botanical Magazine (tab. 4903), are the curled hook-like tops of the leaves, the leaflets forming a rather wide V; they are often quite entire.

The pith is used in making Kaffir bread.

8. E. Altensteinii (Lehm. Pugill. vi. 11, t. 4, 5 (1834)); stem up to about 16 ft. high and about 2 ft. in circumference; young stem ovoid, woolly; leaves green, numerous in crown, nearly straight, up to 5 ft. long; rhachis soon glabrous; leaflets spreading at a wide angle from the rhachis, moderately spaced, very numerous, the largest in the middle, the lower reduced in size but not becoming prickles, all rather broadly linear-oblong, the middle ones about 6 in. long and 1 in. broad, with about 3–5 teeth on both margins, in old plants becoming entire or nearly so; nerves usually inconspicuous; male cones 1 to several, shortly pedunculate, yellowish, cylindric, slightly tapered to the base, about 12–15 in. long and 4 in. in diam.; scales beaked-acuminate, with a recurved flattish top: female cones usually solitary, sessile, yellowish brown, broadly oblong-ellipsoid, about 1½ ft. long and 9 in. in diam. usually with about 15 spirals of scales, up to about 40 lbs. in weight; scales rhomboid-umbonate with a truncate concave top, very rugose; seeds red, oblong, about 2 in. long. Hort. Belge Journ. Jard. and Amat. iv. 167, pl. ix (1837); Miq. Monogr. Cycad. 51, incl. vars. *semidentatus* and *angustifolius* Miq. l.c. (1842); Miq. in Linnæa xix. 420, t. 5 (1847); Miq. Prodr. Cycad. 10 (1861); DC. Prodr. xvi. ii. 532, incl. var. *eriocephalus* Vriese Descr. Pl. Nouv. Jard. Leyd. t. 2; Gard. Chron. vi. 392–97, figs. 80–83 (1876); ser. 3. ii. 281 (1887); Hook. f. Bot. Mag. tt. 7162–3 (1891); Schuster in Engl. Pflanzenr. Cycadac. 112, with figs. (1932). *E. Marumii*, Vriese Tijdschr. Nat. Gesch. v. 188 (1838). *E. Vromii*, Malte Recherch. App. Lib. Lign. Cycad. 70, name only. *E. transrenosus*, Stapf & Burtt Davy in Fl. Transvaal i. 40, 99, fig. 4B (1926). *E. regalis* Hort. *Zamia spinosa*, Lodd. ex DC. l.c., name only. *Z. spinulosa* and *Z. spinosissima*, Hort. ex Miq. Monogr. Cycad. 51 (1842).

GEOGRAPHICAL RANGE: River valleys from the Kowie River, Bathurst Div., to Natal and the Eastern Transvaal, ascending to 3500 ft. alt. in the Amatola Mts.

Bathurst Div.: Bathurst, *Rattray in Herb. S. Afr. Mus.* 1099! King Williamstown, *Sim in Herb. S. Afr. Mus.* 847! East London Div.: Nahoon R., E. London, photo. by *Pearson* in *Herb. Galpin*! East London Park, *J. Wood*

in Herb. Galpin 7104 ! Komgha Div. : near Komgha, *Flanagan* 1372 (in Herb. S. Afr. Mus. 24360) ! Transkei Div. : Kei Road, *Rogers* 3225 ! Kentani, valleys, *Pegler*, 1116 ! Living specimens at Kew ! (I have not seen specimens from Natal and the Transvaal.—J. H.)

According to notes by Dr. Rattray, this species occurs from the Kowie River valley in the Bathurst Div. as far as Durban, and extends from the coast hills to the Amatola Mountains ; usually it is found in shady situations, and when well sheltered may reach a height of 18 ft. Plants which have not developed aerial stems are often hard to distinguish by their vegetative characters from *E. villosus*, which occurs in similar situations. In the latter species, however, the lower leaflets are much reduced and resemble prickles. Dr. Rattray also notes the interesting fact that the production of cones decreases as the southern limit of distribution is reached. In this region (Kowie Valley), in January 1908, he carefully examined more than a hundred well-developed plants and found the remains of only one male cone. Further north in the Nahoon and Gonubie valleys cones were produced in fair abundance. In Natal the species cones very freely. Baboons and monkeys play a part in distributing the seeds ; they collect and carry them to the tops of cliffs or trees, rejecting the essential hard kernel and eating only the delicate soft outer coat of the seed.

9. E. Woodii (Sander in Gard. Chron. 1908, 257, with habit figure) ; stem up to 18 ft. high, stout ; leaves green, numerous in a crown, slightly recurved, about 6 ft. long ; lower leaflets ovate, inclined to be gradually reduced to prickles, the middle ones the longest, ovate-lanceolate to broadly lanceolate, up to about 8 in. long and $1\frac{1}{2}$ in. broad, the upper ones more crowded and arcuate. the lowest almost lobate-dentate on one or both margins, the uppermost leaflets often becoming entire, the apex and teeth pungent-pointed ; nerves numerous, fairly distinct ; male cones subsessile, rather slender, cylindric, up to 4 ft. long ; scales very numerous, long-pointed with a small truncate top ; female cones not seen. Prain in Kew Bull. 1914, 250, with habit fig., and 1916, 181 ; Schuster in Engl. Pflanzenr. Cycadac. 120. *E. Altensteinii* var. *bispinna*, J. M. Wood Ann. Rep. Bot. Gard. Natal 1907, 8, with fig.

GEOGRAPHICAL RANGE : Known only from Zululand.

Zululand : Ngoye, *Wylie* ! without definite locality, *Medley Wood* ! Cult. in Durban Bot. Gard. (*Natal Herb.* no. 16044 !).

This appears to be rather a distinct race or species very closely allied to *E. Altensteinii* and to *E. Hildebrandtii*, the latter from East Africa ; from the former it is distinguished by its usually much broader leaflets, which tend to become reduced to prickles towards the base, a character unknown in *E. Altensteinii*, but a prominent feature in *E. Hildebrandtii*; the latter, however, has the narrower leaflets of *E. Altensteinii*. There is a fine plant of *E. Woodii* in the Palm House at Kew.

10. E. paucidentatus (Stapf & Burtt Davy in Burtt Davy, Fl. Transvaal i. 40, 99, fig. 4, A (1926)) ; stem about 6 ft. high ; trunk about 3 ft. in diam. ; leaves green, about 8 ft. long, somewhat twisted ; rhachis shortly puberulous with crisped hairs, soon becoming glabrous or nearly so ; leaflets about 70 pairs, those towards the base spaced out and rather abruptly reduced to prickles, those higher

Fig. 8.—ENCEPHALARTOS WOODII Sander.—(1) Basal portion of leaf showing reduction of leaflets to prickles, typical of the species; (2) upper portion of leaf; (3) leaflet from about the middle; all reduced.

up more or less contiguous, narrowly or almost linear-lanceolate, somewhat falcate, the middle ones about 25 cm. long and 2·5–3 cm. broad, with about 30 closely parallel nerves below, more or less permanently shortly pubescent below, becoming glabrous or nearly so above, the upper leaflets entire, becoming more dentate to spinose-dentate towards the base; male cones pedunculate, much curved, 1½–2 ft. long, about 6 in. in diam.; peduncle thinly pubescent; scales broadly oblong-oblanceolate, about 2½ in. long, glabrous, the lower ones an irregular subrhomboid-orbicular top with irregularly toothed margin, the upper ones broadly acuminate and very rugose; male sporangia nearly covering the lower surface of the scales; female cones not seen.

GEOGRAPHICAL RANGE: North-eastern Transvaal; in partial shade. 3000–4000 ft.

North-eastern Transvaal: Breslau, Limpopo River, *Legat in Nat. Herb. Pretoria*, 5185! near Barberton, 3000–4000 ft., *Thorncroft in Herb. Rogers*, 28426! Moodies Estates farm, Oorskot, near Barberton, *Van Elden in Nat. Herb. Pretoria*, 10085!

11. E. cycadifolius (Lehm. Pugill. vi. 13 (1834)); stem stout, up to 10 ft. high, densely woolly; leaves numerous, up to 5 ft. long, straight or nearly so; rhachis densely woolly when young, subterete; leaflets very numerous and crowded, usually overlapping, straight or nearly so, linear, very shortly pointed, the middle ones the longest, about 5–6 in. long, about $\frac{1}{6}$ in. broad, rigid, with very thick margins and 8–9 contiguous thick very conspicuous nerves; male cones shortly pedunculate, curved, cylindric, 8–10 in. long, about 3 in. in diam., very thickly and completely covered with brownish wool like cotton wool; scales rather thin and flat, with a narrow woolly top and thin margins, except for the margins completely covered with sporangia; female cones several, oblong-ellipsoid, about 10 in. long and 5–6 in. broad, very densely woolly like the male; scales peltate with recurved glabrescent extremities, the top elliptic and densely woolly; seeds yellow, about 1½–2 in. long and 1¼–1½ in. in diam. Miq. Monogr. Cycad. 43, t. 1, fig. y–z (1842); DC. Prodr. xvi. ii. 531, partly: Schuster in Engl. Pflanzenr. Cycadac. 108 (excl. syn. *E. Ghellinkii* Lem.). *Zamia cycadifolia*, Jacq. Fragm. 27, partly (as to t. 26 only *) (1800); Pers. Synop. ii. 631; Spreng. Syst. iii. 908. *Encephalartos Friderici-Guilielmi*, Lehm. Pugill. vi. 8 (1834); Miq. Monogr. Cycad. 44 (1842). *E. acanthus*, Masters in Gard. Chron. 1878, ii. 810.

GEOGRAPHICAL RANGE: From Kliplaat in the Jansenville Div. (*fide* Marloth), Cathcart, Queenstown and Tsolo districts; an inland species growing at 3000–5300 ft. alt., at least 60 miles distant from the coast.

Jansenville Div. (fide *Marloth*): Uitenhage, *Zeyher* (Herb. Mus. Brit.)! Cathcart Div.: near Cathcart, *Sim*, 2999! without locality, 5300 ft., *Kuntze*!

* Jacquin's t. 25 is of a glabrous female cone, probably of *E. villosus* Lem.

Queenstown Div.: amongst rocks on mountain tops around Queenstown, 4000–4500 ft., *Galpin*, 1525! Summit of Mbumbula Range, Queenstown, 4700 ft., *Pearson* (photo.)! Oxton Manor, Queenstown, 4000 ft., *Hay in Herb. Galpin*, 8411! King Williamstown Div.: near King Williamstown, *Sim in S. Afr. Mus. Herb.*, 1347! Tsolo district (*fide* Rattray).

Our knowledge of this species dates from Jacquin (Fragmenta Botanica, p. 27) in 1800. Unfortunately he confused two species. He described and figured at t. 26 a leaf of the plant which has always been known either as *E. cycadifolius* or *E. Friderici-Guilielmi*. But the female cone shown by him in t. 25 is probably that of *E. villosus* Lem., a species not recognised and described until 1867; this female cone is quite glabrous and the seeds are red, whereas in *E. cycadifolius* the female cone is very densely and permanently woolly, and the seeds are yellow.

12. E. lanatus (Stapf & Burtt Davy in Burtt Davy Flora Transvaal i. 40, 99, fig. 4 D (1926)); stems several feet high, simple; leaves numerous in a cluster, those of the previous seasons persisting and hanging for some time; rhachis very woolly, especially when young, subterete; leaflets numerous, crowded, the middle and upper ones overlapping, linear, very pungent-pointed, about 4 in. long and $3\frac{1}{2}$ lin. broad, glaucous and pilose above, soon glabrous, with 12–14 prominent and contiguous nerves below, margins very thick and callus-like, at first ciliate with woolly hairs; male cones shortly pedunculate, cylindric, slightly narrowed at each end, nearly 6 in. long and 2 in. in diam., with about 12 spirals of scales; scales narrowly rhomboid at the top and densely woolly-tomentose, about $\frac{3}{4}$ in. across; female cones shortly pedunculate, cylindric, abruptly narrowed at each end, about 7 in. long and 3 in. in diam., with about 9 spirals of scales; scales very broadly rhomboid, about 1 in. deep and 2 in. broad, densely but shortly tomentose except towards the margin which swells and forms a thick glabrous callus; seeds broadly ellipsoid, about 1 in. long, probably yellow. *E. lævifolius*, Stapf & B. Davy l.c. fig. 4 e (1926).

GEOGRAPHICAL RANGE: Eastern Transvaal, from Middleburg through the Godwan River area to Barberton district, at 3000–5000 ft. altitude.

Transvaal: Middelburg district; Mooi Kopje, *Pole Evans in Nat. Herb.*, 11427! Middelburg, *Merwe in Nat. Herb.*, 8041! Toevlugt, near Middelburg Town lands, *Weeber in Colon. Herb.*, 6471! Lydenburg district; Crocodile River, near Piet Schoeman, Apr. 1885, *Wilms*, 1355! (Herb. Mus. Brit.). Barberton district; Godwan River, 3000–4000 ft., *Thorncroft in Herb. Rogers*, 28427! *Rogers*, 23689! Moodies, near Barberton, *Todd in Natal Herb.*, 2043! Edge of Black Reef quartzite escarpment, 1 mile from Berlin Forestry Station, up to 10 ft., suckering freely, *Van Nouhuys in Nat. Herb. Pretoria*, 10086!

13. E. Ghellinckii (Lem. Illustr. Hort. xiv. Miscell. 80 (1867)); stems up to 6 ft. high (or more?), in nature the lower part often resting on the ground, covered with the persistent corky leaf-bases; leaves up to about 3 ft. long, graceful; rhachis at first woolly-villous, with one obscure rib above and below; leaflets numerous, widely spreading, subacicular, with strongly recurved margins, abruptly very pungent-pointed, the middle ones the longest and

about 4 in. long, woolly-tomentose when young, at length thinly pubescent on the upper side, not visibly nerved below but with about 4 obscure parallel nerves ; male cones sessile, slightly curved, cylindric, about 9 in. long and 3 in. in diam., densely woolly ; scales lax when mature, the top irregularly rhomboid, remaining densely woolly, shortly stalked, nearly covered with microsporangia ; female cone very shortly pedunculate, broadly oblong-ellipsoid, about 15 in. long and 9 in. in diam., with about 9–11 spirals of very densely woolly brownish scales ; scales remaining woolly, shortly peltate, with recurved edges ; seeds very broadly oblong-ellipsoid, about $1\frac{1}{4}$ in. long, sordid brown or yellowish with a tinge of red towards the base. Lem. l.c. xv. pl. 567 (1868) ; Seward in Proc. Camb. Phil. Soc. ix. 341, habit fig. (1898). *Zamia Ghellinckii*, Hort. ex Lem. l.c. *E. cycadifolius* var. *Friderici-Guilielmi*, Schuster in Engl. Pflanzenr. Cycadac. 109, partly (as to syn. *E. Ghellincki* Lem.).

Geographical Range : Natal, apparently from almost sea-level to about 5000 ft. on the eastern slopes of the Drakensberg.

Natal : Umzimkulu River, *Nelson* 16 ! Umzimto district, *Wood in Natal Herb.*, 13055 ! near the Umtwalume River, *Sanderson* 119 ! Tugela Falls, Mont Aux sources, *Doidge* (cult. at Pretoria Nat. Herb. no. 8038) ! Tugela Gorge, *Pulterill in Nat. Herb.*, 12446 ! *J. M. Wood*, 11865 ! In shady rocky places, *Hutchinson*, 4536 ! Alexandra district ; stony slopes, Umgaye flats, Dumisa, *Rudatis*, 1299 ! Without definite locality, *White* ! *Vyvyan* !

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[SYNONYMS ARE PRINTED IN *italics*.]

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